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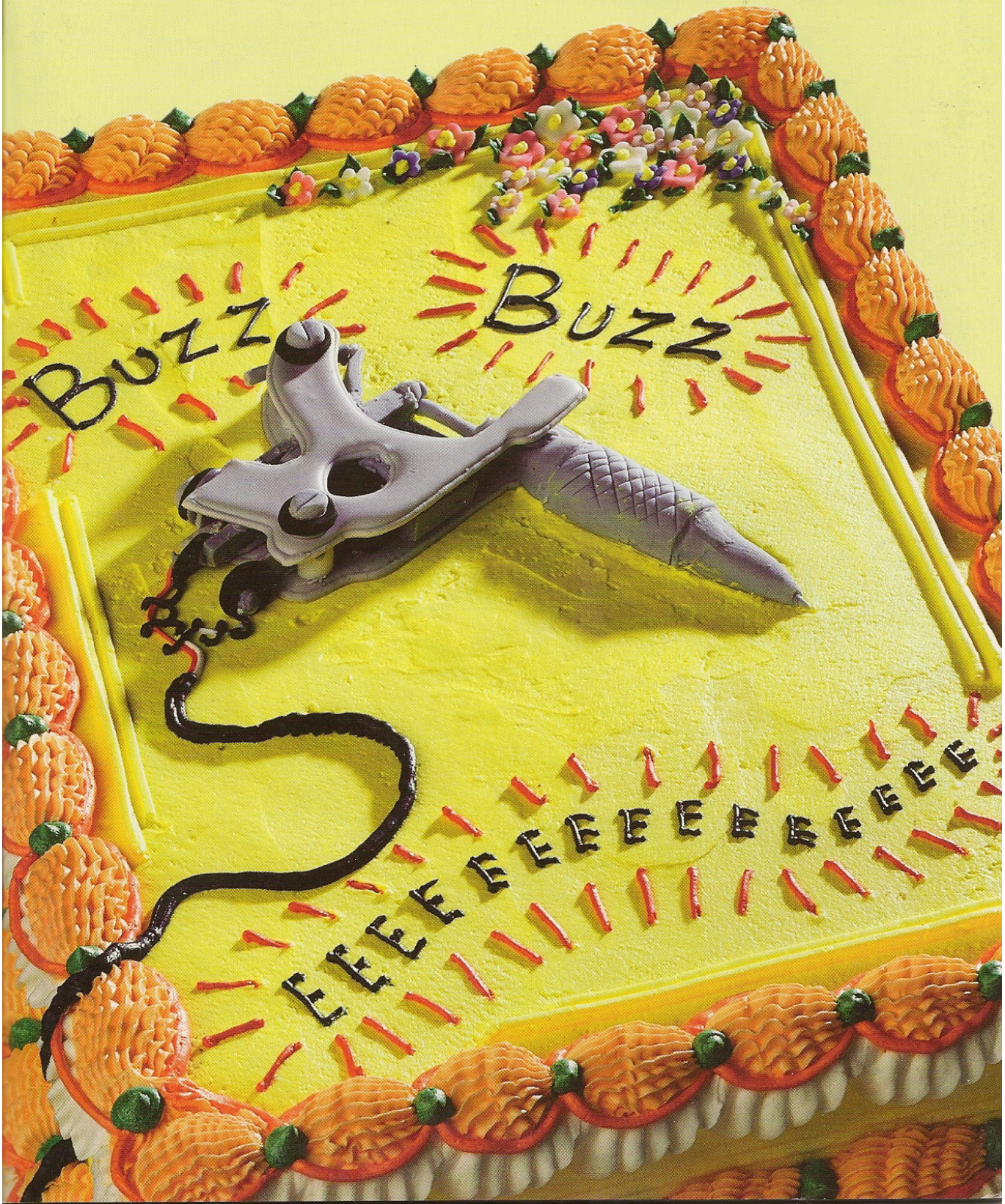

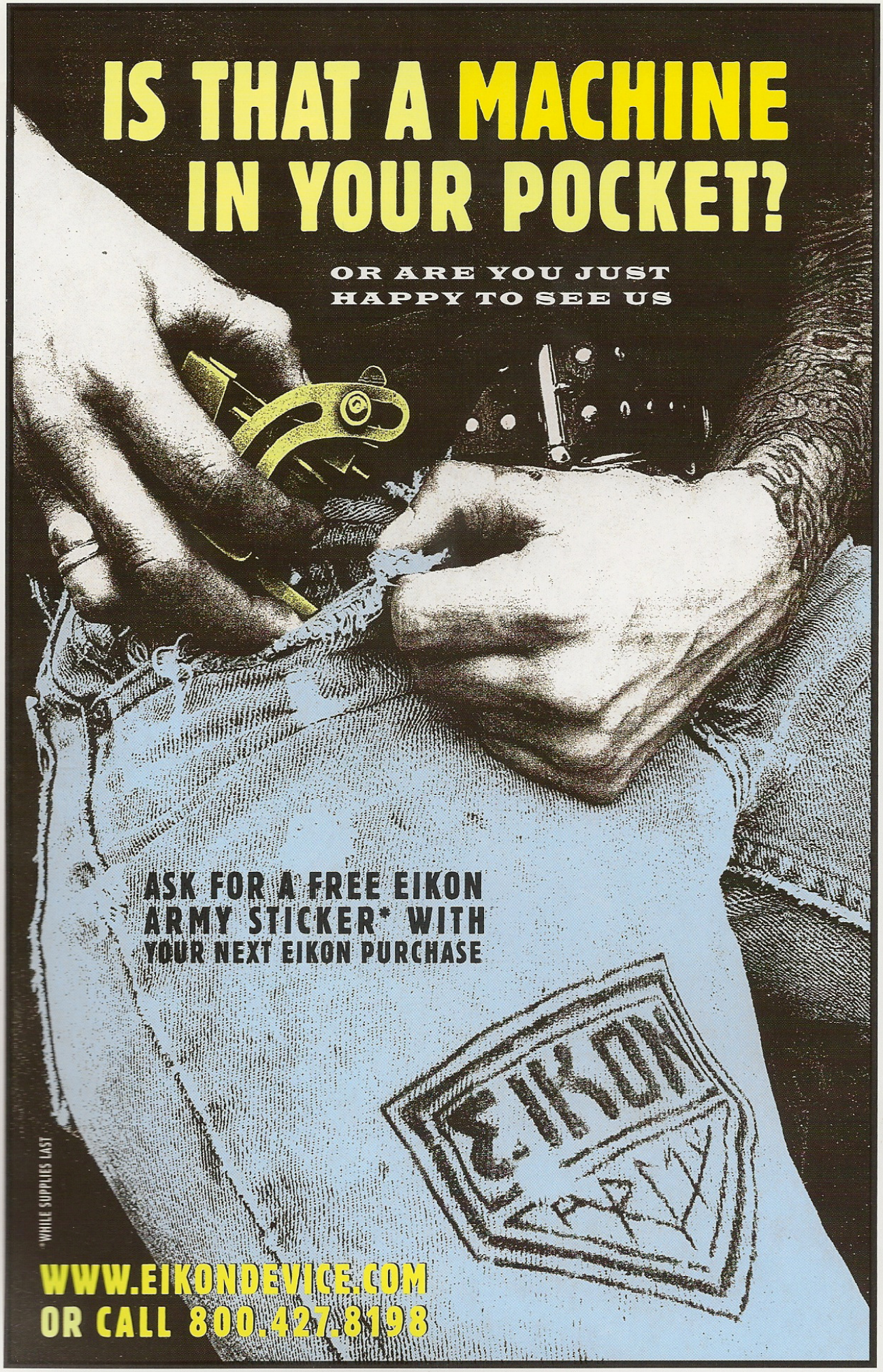
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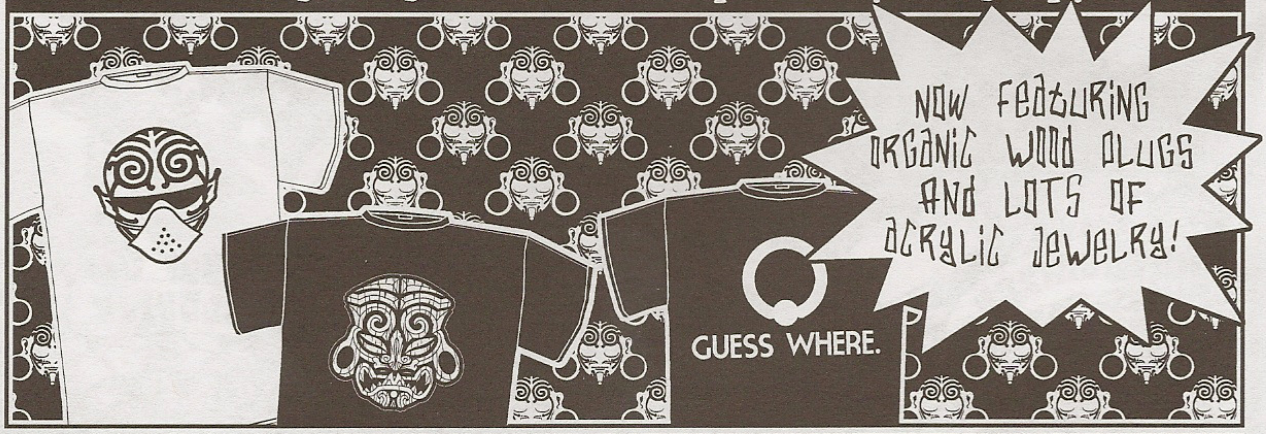

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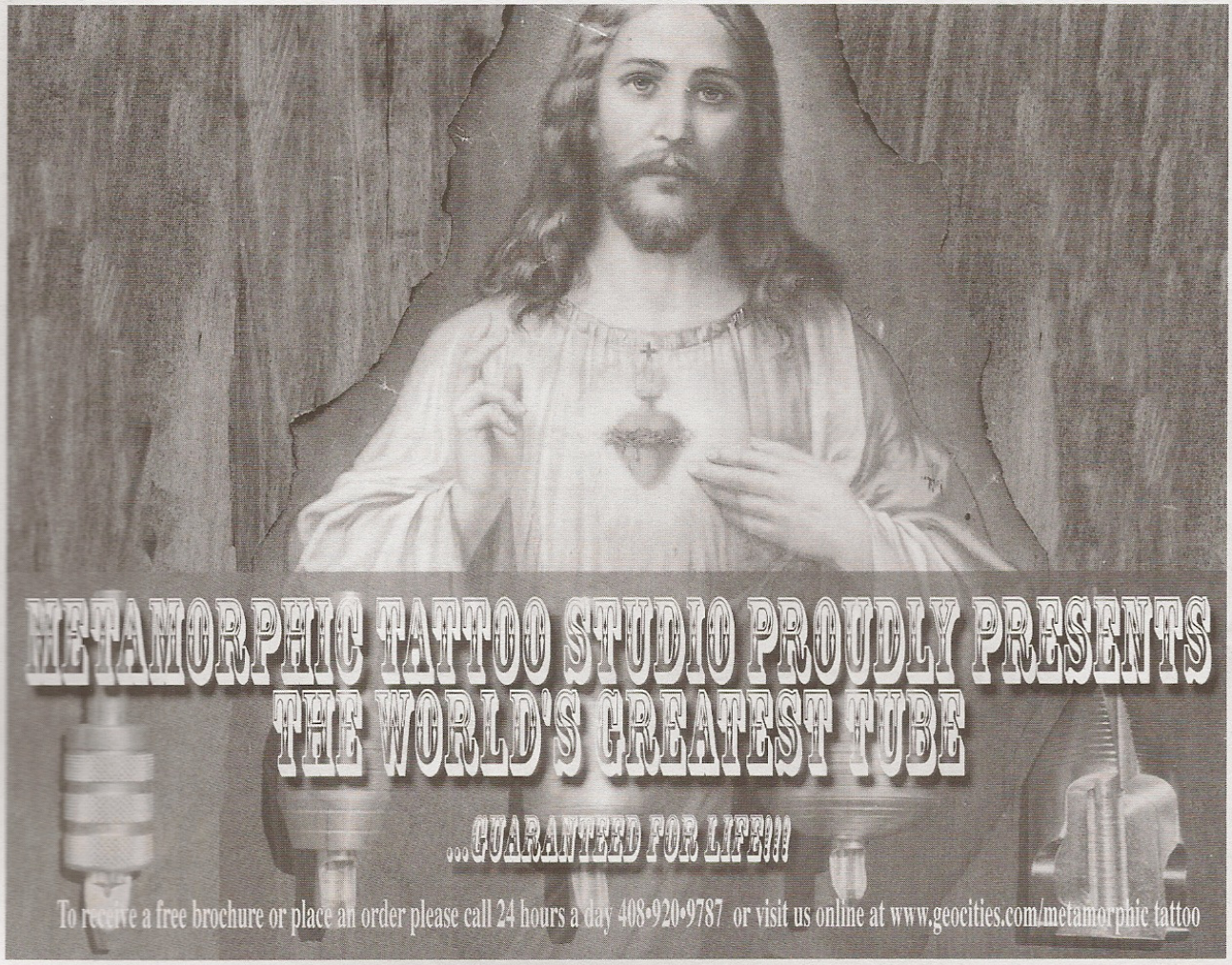
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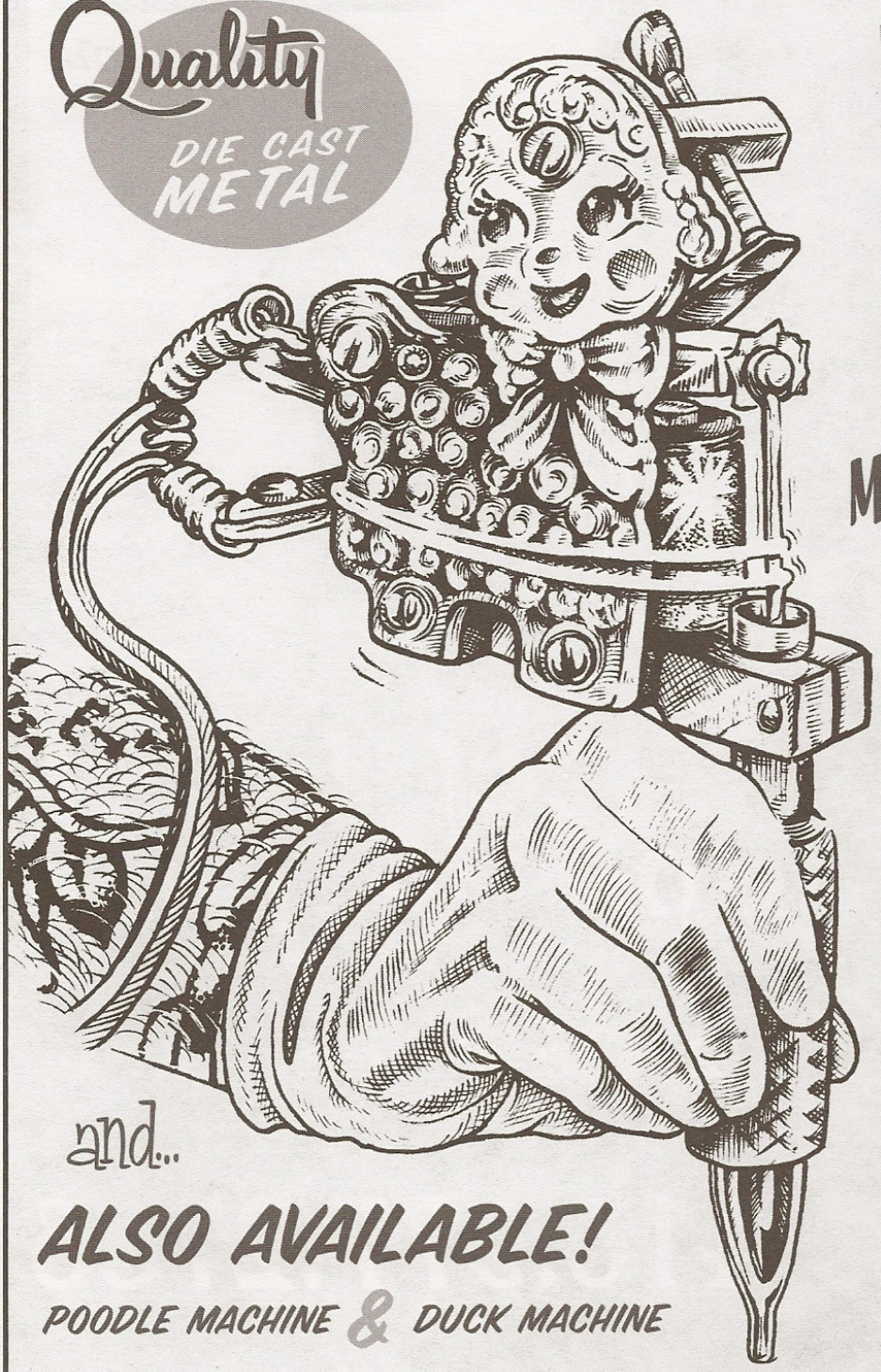

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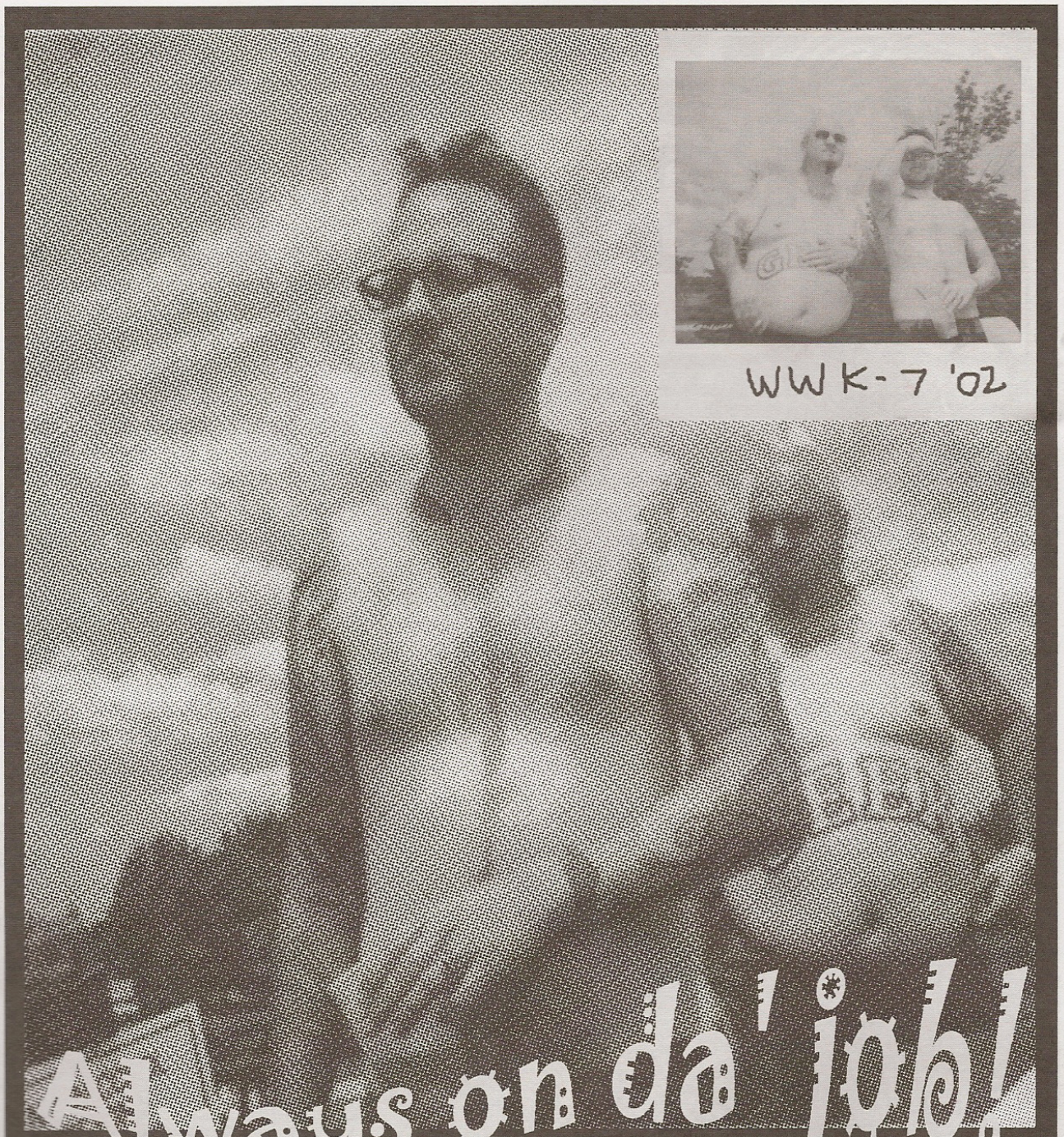

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EDITOR
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COVER PHOTO BY EVAN DION, CAKE AND DECORATING BY JAMES ARCHIBALD

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EDITORIAL

BY BILL BAKER

There are all kinds of tattooing; good, less than good and downright awful. There are also all kinds of tattooers, shops and customers. All these different aspects of tattooing have their own merit, kept in context of who, what, where, when and why. It may not all be good, but diversity is an important part of what tattooing is. A customer that is happy in a skid-row shop wouldn't be happy or even comfortable in an upscale studio. The bad in tattooing will never be eliminated; but maybe the level of ignorance in the trade could be reduced.

At this point tattooers should not be able to say "I'm not responsible because I didn't know that". It's widely accepted that information about sterile procedure must be available and understood by everyone who tattoos. What some people don't seem to understand is that the mechanical variables in tattooing are also important information that all tattooers should have access to and understand. Nearly one hundred years ago when tattooers were first figuring out how the electric machine worked, things were kept secret. Many of those tattooers really knew things about the machine and its function. As closely guarded as their secrets were, it did not keep people from starting to tattoo. After decades of misleading information being carefully doled out as secrets of the trade, what was true and what wasn't became unclear. As this information filtered down from generation to generation of tattooers, fiction became accepted as fact. It was only a matter of time until the real secret in tattooing was that most tattooers didn't know anything about tattooing except where to buy some supplies.

It was only a matter of time until the real secret in tattooing was that most tattooers didn't know anything about tattooing except where to buy some supplies.

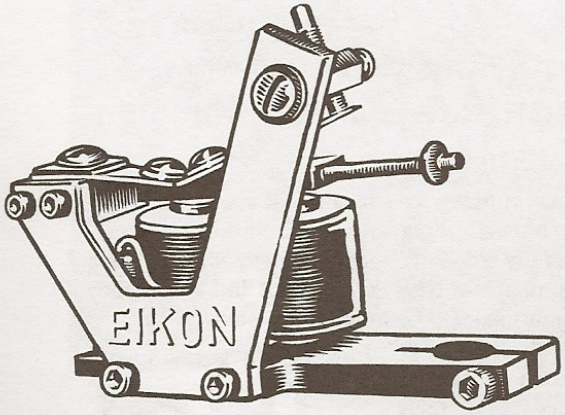
What they didn't keep secret though, was how much money they were making. Conspicuous consumption combined with a lack of reverence for the trade opened the floodgates.

Customers who should have been presented with the image of a hard-working professional in a position of great responsibility instead saw an irresponsible nincompoop who was making a lot of money without exerting much effort. It is no wonder that customers became tattooers. Although many of them have brought higher standards artistically and technically to the trade, the fact remains that the secret-keeping and obstructive deceit that was intended to keep them out of the trade, did not. Now we have a new generation of tattooers saying there are too many people in the trade. Once again, it's new traditionalists acting like the old traditionalists, saying it's really different this time ...not like when they started tattooing.

Things really get no worse, or better. MGM

GREEN MONSTER

A machine that runs at 300 Hz is too fast to tattoo with. This machine wasn't built to tattoo with, it was built to test all the components on a machine at their limits. Then we can apply that knowledge to a machine that runs at the speed we need to tattoo with.
The testing isn't quite over, but already we've learned more than we thought we would. Some things that we expected to happen, didn't, and some things happened that we never would have expected.



The first thing we wanted to test was whether or not the material that the frame is made of has any effect on machine performance.

We made three side plates, all with identical geometry and tolerances. One was made of brass, one of aluminum and one of stainless steel. We set up the machine with the brass side plate. We ran the machine and recorded the results.

Then we replaced the brass side plate with the aluminum side plate, changing nothing else on the machine. We carefully replicated all the measurements and gaps on the machine. We ran it and recorded the results.

We then went through the process again, this time using the stainless steel side plate.

In each of the tests, we ran the machine first with no capacitor, then with a 22uF capacitor and a third time with a 47uF capacitor.

Without a capacitor it was difficult to measure the duty cycle accurately because of the arcing at the point gap. With a capacitor, whether 22uF or 47uF, the machine ran smoother with virtually no spark. In every case the machine ran the fastest with no capacitor installed.

No matter how many times we ran these tests, the stainless steel side plate ran the fastest. The truth is, once we applied a margin of error of ± 2% to the numbers, the difference in speed from one side plate to another was marginal. Without a capacitor, the stainless steel side plate ran slightly faster, but within 4 Hz of the brass and aluminum side plates. With a 22uF capacitor, there was no difference in speed or performance with any of the side plates. With a 47uF capacitor, the aluminum side plate ran slightly slower than the other two, but within 3 Hz. A machine's performance is not affected by the choice of frame material - whether it is brass, aluminum, or stainless steel.

Capacitors, on the other hand, drastically affect the speed of a machine. In every test the 47uF capacitor dropped the speed of the machine by about 50 Hz. The 22uF capacitor dropped the speed of the machine by about 15 Hz. That is a big difference. In day-to-day tattooing the difference between a 22uF capacitor and a 47uF capacitor is important to know. If you are trying to get a machine with a 47uF capacitor on it to run fast, you are going to have a battle on your hands. Simply change the capacitor to a 22uF and the machine speed will increase by at least 15 Hz instantly.

The next series of tests we did was to determine whether or not the number of wraps on a coil have any effect on the machine's performance.

We had three pairs of coils, all made by the same manufacturer. All the coils had the same core, height and diameter. One pair of coils were 12 wrap, one 10 wrap and one 8 wrap. The resistance was the greatest in the 12 wrap coils and the least in the 8 wrap coils.

The first set of coil tests were set up like the tests on the side plates. All the measurements on the machine remained constant, including the voltage. Only the pair of coils were changed in each test. The duty cycle was the same with each pair of coils. The 8 wrap coils ran the fastest and the 12 wrap coils ran the slowest.

Coils # of Wraps	Spring Thickness Inches Front	Back	Air Gap Inches	Point Gap Inches	Stroke Inches	Voltage	Side Plate Material	Capacitor uF	Duty Cycle Closed Percentage	Speed Hz
8	.030	.023	0.022	0.016	1/16	6.7	Brass	w/o	56	252
8	.030	.023	0.022	0.016	1/16	6.7	Brass	22	51	239
8	.030	.023	0.022	0.016	1/16	6.7	Brass	47	45	214
8	.030	.023	0.022	0.016	1/16	6.7	Aluminum	w/o	55	255
8	.030	.023	0.022	0.016	1/16	6.7	Aluminum	22	52	243
8	.030	.023	0.022	0.016	1/16	6.7	Aluminum	47	38	201
8	.030	.023	0.022	0.016	1/16	6.7	Stainless Steel	w/o	59	269
8	.030	.023	0.022	0.016	1/16	6.7	Stainless Steel	22	55	245
8	.030	.023	0.022	0.016	1/16	6.7	Stainless Steel	47	40	211

THIS TEST DETERMINED THE MAXIMUM SIZE OF AIR GAP THE COILS COULD OVERCOME AT A GIVEN VOLTAGE.

The next two tests were to determine which pair of coils generated the strongest magnetic field at a given voltage. The machine was set-up identically for each pair of coils. The voltage was the same for each pair of coils. In the test, the contact screw was turned out until the coils could not start the machine. If the contact screw were turned in even slightly, the machine would start. This test determined the maximum size of air gap the coils could overcome at a given voltage. The 8 wrap coils were able to overcome a larger air gap than the 10 and 12 wrap coils. The 8 wrap coils generated more magnetism at a given voltage than the coils with more wraps.

Coils # of Wraps	Resistance Ohms	Spring Thickness Inches Front	Back	Voltage	Maximum Size of Air Gap Inches
12	3.4	.030	.023	6.7	0.050
10	2.7	.030	.023	6.7	0.061
8	2.0	.030	.023	6.7	0.067

THIS TEST DETERMINED HOW MUCH VOLTAGE WAS REQUIRED TO GENERATE AN EQUAL AMOUNT OF MAGNETISM.

In the next test the machine was set up identically for each pair of coils. The size of the air gap was the same for each pair of coils. The voltage was increased until the machine began to run. The voltage required to run the machine with that size of air gap was recorded. This test determined how much voltage was required to generate an equal amount of magnetism. The 8 wrap coils generated the required amount of magnetism at less voltage than the coils with more wraps.

Coils # of Wraps	Resistance Ohms	Spring Thickness Inches Front	Back	Air Gap Inches	Voltage Required
12	3.4	.030	.023	0.067	9.6
10	2.7	.030	.023	0.067	7.9
8	2.0	.030	.023	0.067	6.8

We thought that coils with more wraps would be stronger and more powerful than coils with less wraps, but we were wrong. Coils with more wraps are larger and heavier than coils with less wraps. They also require more voltage to do the same work as coils with less wraps. If you want to run low voltage, use coils with less wraps.

At this point we had learned three or four important things that can be applied to the everyday running of any machine... but we didn't have the Green Monster running at 300 Hz.

With our fastest side plate, eight wrap coils, a .030" thick front spring, a .023" thick back spring and no capacitor, the machine was maxed out at 271 Hz, with a 62% duty cycle. Running the machine without a capacitor makes no sense at all - it has a giant spark at the contact point and runs fast, but terrible.

We can't get spring stock thicker than .030", so the only way to make that front spring harder was to double it up. We added a .021" thick front spring under the .030" thick front spring that was already on the machine. We cut a new back spring out of .030" thick spring stock and put a 22uF capacitor on the machine. It ran 258 Hz with a 53% duty cycle. Even with all that back spring force to overcome, the machine still only needed 7.4 volts to run. The relatively low voltage was due to the very small air gap.

A speed of 258 Hz is still a long way from 300. We took the capacitor off. That gave us twenty-three more Hertz, 281 now but with that ugly no capacitor noise, spark and a duty cycle of 60%.

At this point the mid-afternoon excitement over how much a capacitor could reduce speed was long gone. We were sick of tightening and loosening screws and measuring the air gap. The Green Monster had been set up, broken down and set up again almost one hundred times since noon... and still we hadn't hit 300 Hz.

We cut another spring out of .030" thick stock. On the previous run, even with the capacitor, the duty cycle was a little high, so we were sure this double .030" thick front spring would not only be faster, but would make the machine run better. The faster you want the machine to go, the harder the front spring should be. We still had the .030" thick back spring on the machine and the 22uF capacitor. It ran 282 Hz, with a 58% duty cycle. The fastest we'd run all day and a pretty good improvement over the previous run... but we were at the limit of the spring stock we had. Those two .030" thick front springs stacked up were as inflexible as steel plate. We took off the capacitor and ran the machine. We were up into the 300's... but with an 80% duty cycle and a spark that could blind you. That is no way to run a machine. Do we need a smaller capacitor?

We know one more thing that is guaranteed to get the Green Monster running faster even with a capacitor. We're going to have to lighten the armature bar. Maybe we'll get it up to 400 Hz next time.

THINGS WE'VE LEARNED FROM THE GREEN MONSTER SO FAR...

1. Frame material doesn't affect machine performance.
2. Different capacitors really make a big difference in machine speed.
3. Smaller wrap coils will run a machine faster. Larger wrap coils will make a machine run slower.
4. Smaller wrap coils put out a stronger magnetic field at lower voltage than coils with more wraps.

Next time... more capacitors, contact points, fine tuning and we'll definitely be running solidly in the 300's! MGM

INTERVIEW
JUNE 2002

Juan

Bill Baker: When did you start tattooing?

Juan Puente: Ninety-one.

Where?

Out of my house, basically. Cory Miller started me out, and it was funny because he helped me get my stuff from National, and he just said "Don't tell anybody 'til you're good!" That's like my favorite story of my whole career. Cory saying that, you know.

Wow, is it okay if we print that?

Yeah, it's been printed before.

Alright.

It's just funny because I'd have to say in my tattooing career I've had some people take some really big chances on me and I think in the past ten or eleven years I've paid them back by doing well and keeping my end of the bargain up. So that was like the first one. I was happy to have completed that one, 'cause he's been a true friend for all those years. He saw something that maybe other people didn't see.

Most of the guys who I've talked to who build machines now, started out by fixing their own machines, trying to get them to run better. Was that true for you?

Yes, definitely. I had those National Swing Gates that I used for the first couple of years when I was working out of my house. Then I worked with Eric Maaske in Fullerton, he got me my first job tattooing and I bought a Micky Sharpz Line - O - Graph. That was the first other machine I had purchased, you know, other than what I had normally been using and it worked really fast and really good and I was really excited about it. It was something new to me and that's where it all kind of started.

So you would take whatever machine you had, or somebody you knew had and try to get it to run as good as another machine you had, that you knew ran well.

Right, exactly.

How many frame styles do you make and sell now?

There's four frame styles right now. The machine I tried to emulate from the beginning - I'll make it clear right now, was a Mike Brown machine.

Mike Brown who worked at Tattooland?

Exactly. His father was a machinist so he made this machine for Mike. There's only five or six of them in existence, period. Cory Miller used one on me when he was tattooing me and we were hanging out and I always asked him - "What kind of machine is that?" and he'd say it's a Mike Brown machine. Mike's dad got it off some kind of motorcycle part and machined it all out of one piece of steel.

Wow.

To me, that's like a Paul Rogers, you know, because there's only five of them made, and I finally got a hold of one, this year. That's about the most amazing thing I think I ever got. I can almost keep the history on who had them. I remember it was like, Cory Miller, Dick Orsaki, Danny Romo, Joe Vegas, of course Mike Brown.

The first machines you made were pre-fabs. Was that so you could work out the geometry before you cast a frame?

Well, what had happened was I built the pre-fabs for myself for a while, next thing you know people were asking me for them, and every so often my buddy Graeme, who's a machinist, would make me ten, or whatever and they'd go pretty much as soon as I had them. I look back on them now and maybe I wouldn't have made them the way I did – but... it all worked out. It did work out all of the bugs of the geometry. I used to use a really long and fat armature bar.

Right.

It was just kind of weird, I look at it now and I don't know if I'd make it the same way now.

Right, but...

Puente

When we first started, we made a Paul Rogers Victory frame style, and an Owen Jensen Chair style. Graeme made me a couple of ones that were of his own design. He had an E.D.M. machine so he could cut things really precisely. He's the one who got me started on all my binding posts and he still makes all that stuff today and the machines. But Danny Dringenberg's the one who really... gosh... man... if it wasn't for Danny I don't know. I was going to buy coils from Dennis Dwyer at one point, 'cause I knew he was making them for Scott Sterling, who was a definite big influence as well, and I don't know what happened, but I just went with Danny. I have to say without Danny Dringenberg and the Scott Sterlings and Creepers and the people who helped me at the very beginning of this, it wouldn't have gone as far as it's gone at all. Of course, Danny by geography we're close and he helps me with everything. It's almost like a team. He really has helped me a lot.

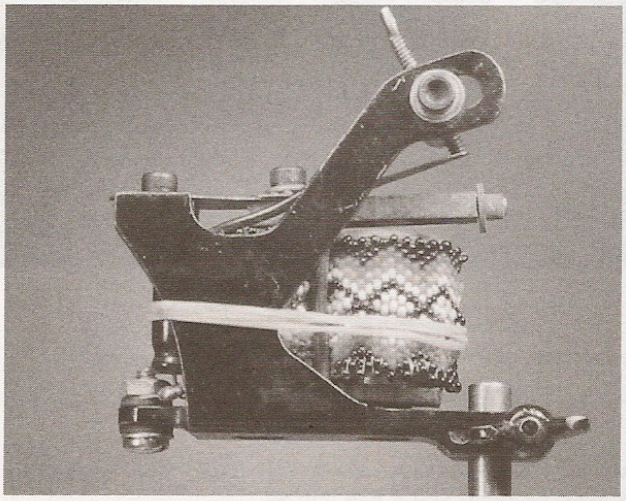
What prompted you to make a cast frame?

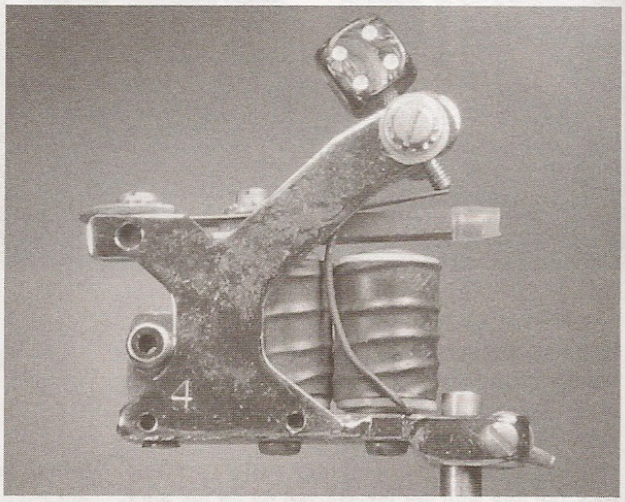
What happened was, I had a friend in San Diego who was a machinist, he saw the machine and said "You know I can make you one of those" and I'm like, oh yeah, well okay fine, I've heard that a million times, you know. Machinists seem to have big eyes on making things, but when it comes to actually making them, they realize there's more work to it than they thought.

Yeah.

But this guy made me like nine frames made out of copper, solid copper and they were all one piece, machined out. Those things worked really well, the copper ones and there were only nine of them. They worked super - awesome. When I moved to San Francisco my friend Graeme, his business was kind of busy making computer parts and whatever they were doing, so he couldn't really keep up, now that there was a slight demand, which to me was pretty interesting, you know I never thought it would become that. So I got the idea to make a cast frame. I

"There's four frame styles right now. The machine I tried to emulate from the beginning - I'll make it clear right now, was a Mike Brown machine."





from left to right: Mike Brown machine, a progression of Juan Puente machines

found a place I liked in Oakland and they turned me on to this stuff called aluminum bronze, which is harder than brass. If you drop a brass machine it'll bend. But this stuff is more like iron, it's super - strong. The only problem with that is it's super - hard to machine as well.

So you could cast it, but the drilling is going to be hard and the finishing work is going to be impossible.

Well, it's not as impossible as you may think... but when you take it to a machine shop to have this stuff worked out, the first thing the guy says is "This stuff is pretty tough, you know, it's eating up bits - it's just normal wear and tear".

Right, it's like stainless. It's hard.

Exactly. They're not saying it's impossible, it's just going to take a little more because of this, that and the other. From the beginning I've used this E.D.M cut on the bottom where the tube vise goes. I remember Scott Sterling would cut the vise with a jeweler's saw. Basically, I just followed that same pattern but used an E.D.M. When you start doing little things like that it gets expensive, but it's worth it as far as the machine is concerned.

Absolutely.

The tube vise just works.

Especially if you're going to make more than five or six machines.

Exactly. I tried to cut one with a jeweler's saw myself and boy did I find myself in a panic, because I'm thinking this is in the brass family, which it is, but this stuff is harder than iron or steel, and I had just made a run of these cast machines, and I made quite a large run, actually.

Sure, because you have to get your price down...

Exactly, and you know, shoot, maybe a hundred years from now someone will find a bunch in a barrel - you never know.

Sure...

So throughout the years you can see how the machining has all been constant to make the height the same for the spring platform and the shelf for the coils. Now every frame I get I take it under a grinding wheel and then a de-burring wheel and I really just kind of work it out where I get it nice and I finish some of them with a brass black. The bronze turns a cool discoloration after you've handled it and used it for a couple of months. So now it's been four, almost five years I've been making these cast ones.

All out of the same material?

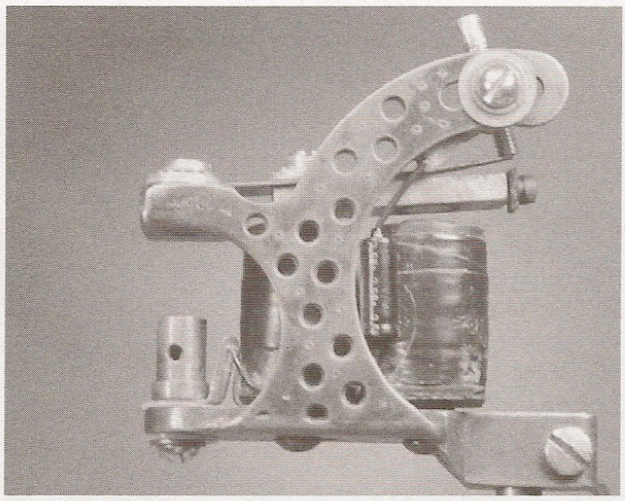
Yes. All aluminum bronze.

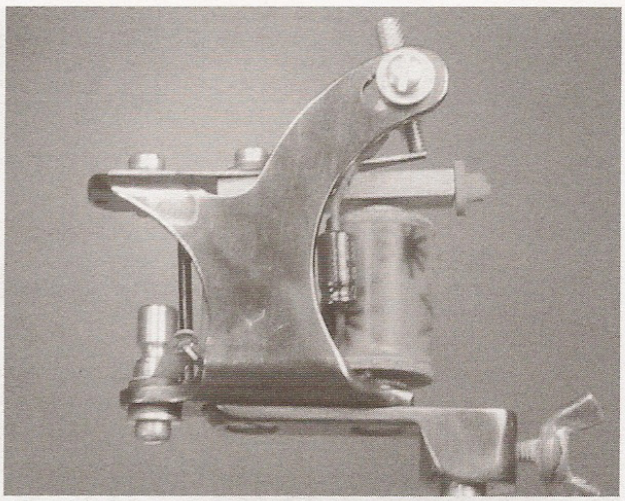
It looks like brass. The same sort of color.

Yes.

Is function really the biggest concern when you're building a machine? Does form follow function absolutely for you, or is appearance some consideration?

Well, it came with the making of the Mike Brown. There's an evolution of the way the frame looks. When I made my machines the one part that really helped me out was I made the back spring shelf so that the same frame could be made for a liner or a shader - now that's where the function really came in. Just thinking about the back spring shelf, set-





ting the screw back a little bit further, so I could have a regular sized armature bar for a liner, or I take a little meat off that back spring shelf, and now I have three quarters if not more, for a shader.

Right, a little longer spring.

And it's all with the same frame. It's not like I had to have a frame cast for a liner and have a frame cast for a shader.

But there is a slight difference to the frame, you do alter it a little, right?

Yeah, yeah, yeah - not that much though. If you looked at them you wouldn't be able to tell the difference unless you had them both in your hand. If I took some more meat off the back spring shelf, it would make the spring longer, for a shader - if I left it the way it was, and just kind of rounded the edge a little bit - it'd be a liner.

A little shorter, but... the exact same armature bar.

The exact same armature bar.

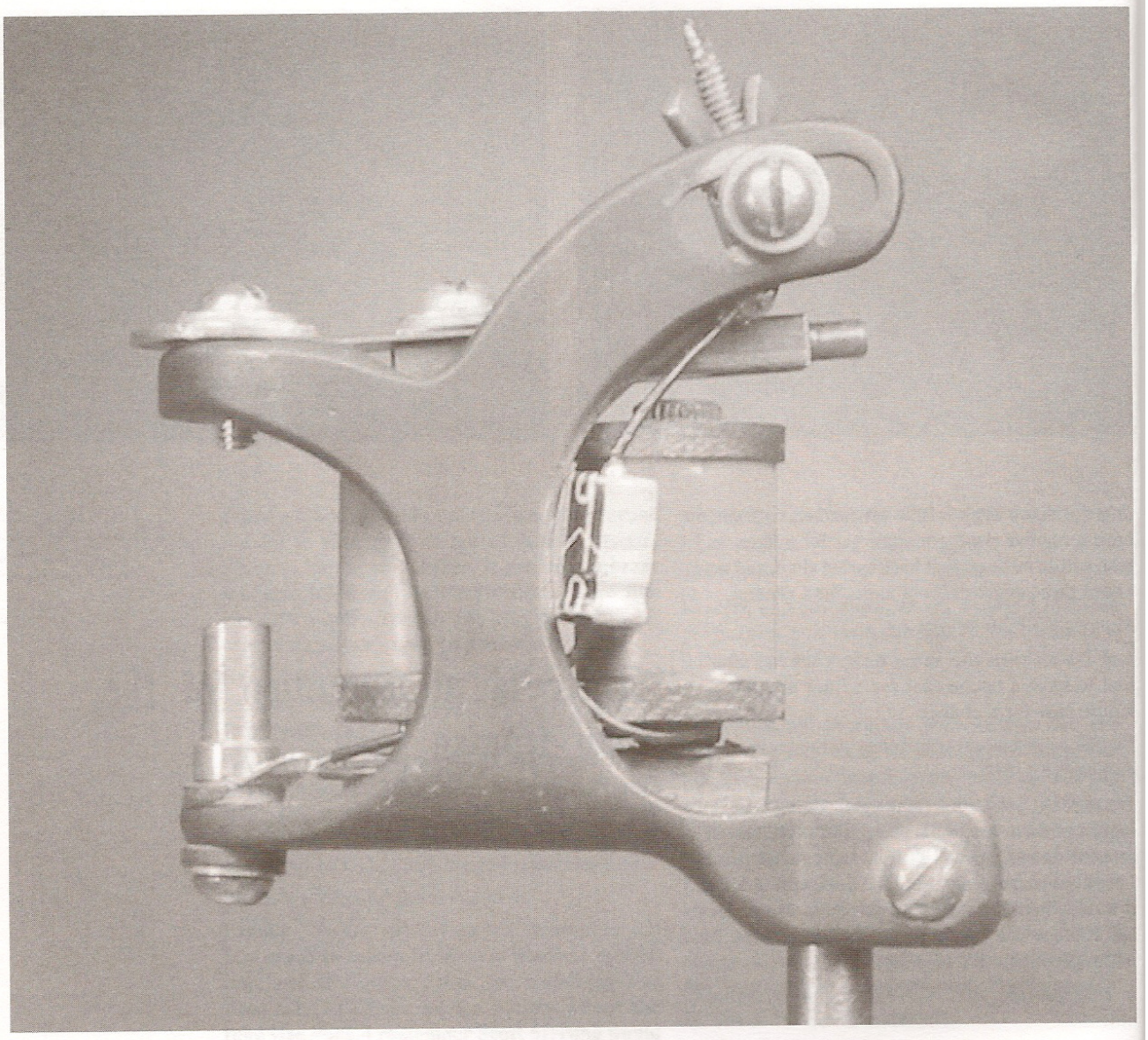
Okay.

And that took a minute to figure out... but it works.

If we're talking just about appearance, what about the finish of the frame?

It just depends. I had some that I drilled holes in. There's a lot of different things I've done to the machines over time. It just depends on what kind of mood I'm in. Like I'll grab a bunch of machines and I'll clean them up real nice and then I'm like, you know, I'm going to drill holes in these ones. Sometimes I won't, but I always have the grinding wheel at hand.

"There is an evolution of the way frames look."



a Puente Bronze machine

What about the finish on the coils?

The coils - Danny Dringenberg helped me with all my coils at the beginning and the same machinist he works with made them for me, with a single knurl, so I could put an end cap on it and glue it, like they used to do in the day and that was it. I'd use a five-sixteenth or three-eighth core, whatever I felt like. I try to keep things to eight wrap. Eight wrap seems to have done really well for me on the three-eighth core and ten wraps for the five-sixteenth, which is the smaller ones. Now I have this kid Ryan Downey, from Las Vegas, he made me a bunch of

coils - coil cores and I had this other company make me the end washers for them. I think I'll be using those for quite some time now.

Just heat shrink on those?

Just tape.

Do you set up your machines for clipcord or RCA jack, or both?

I've gotten a bunch of machines from people and they want to change to RCA jacks - I can do it for them, it's just whatever the people want, really.

Do you use the RCA jacks, or clipcord?

Clipcord.

Yeah, I do, too. Have you got a website?

No website. I just have an e-mail address, it is classicjuan@earthlink.net. For years now I've just done it on my own without any advertising really. Seth has been a big help, I've posted some pictures on his forum, but really it's all been word of mouth. I just try to keep it simple, you know.

And it's working out good for you.

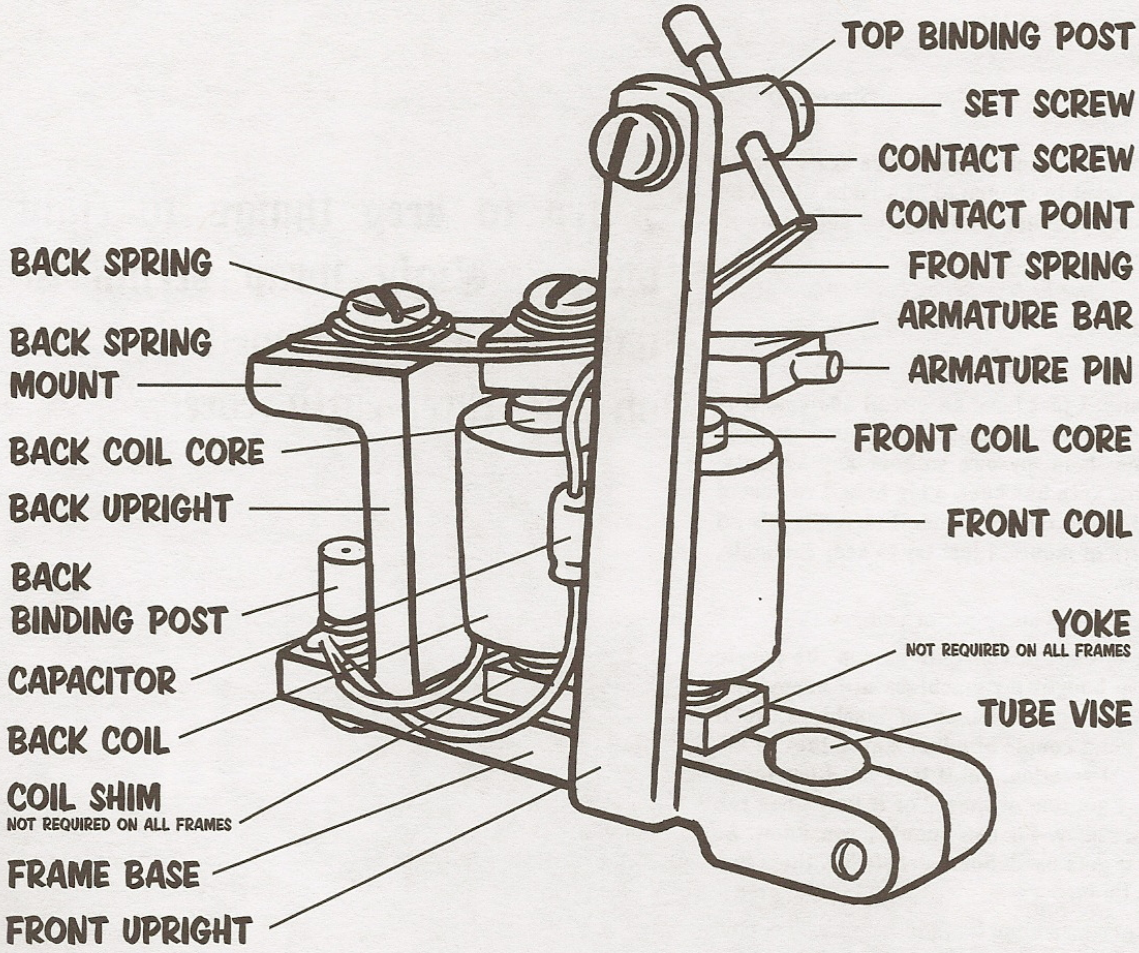
I travel to enough conventions and the people who have bought my machines are happy with them. We've got a bunch of machines, so if they've got a couple of mine, maybe they're not in the first rotation, but if they need two liners - "okay, I got one of these" or if they need two shaders, "okay, I'll use Juan's", you know. As long as it gets used. Some people buy them just to have them.

Well, that's a strange thing to me - but it is true a lot of guys just want a huge collection.

I'll be the first guilty party of that. I buy a new machine here and there because I want to see what people are doing. I like to look at other people's perception of quality. Like wow this guy's got high standards - this dude is really doing it nice. Some of them, well... you know, maybe he got something and kind of put it together a little fast... but I like to see it. I look at some of the older machines that I've got - I see stuff that people have geographically, if I'm on the east coast. I could look at my collection all day long, but I love looking at other people's stuff. MGM

"I try to keep things to eight wrap. Eight wrap seems to have done really well for me on the three-eigth core..."

MACHINE PART NAMES



Machine illustrated is a STANDARD UPRIGHT frame style.

Other frame styles have some parts specific to that style.

SIDE BAR frame style has a bar that connects the front and back uprights.

SIDE PLATE frame style has a side plate instead of front and back uprights.

OPEN SIDED frame style has no front upright, but a top bar that connects the top binding post to the back spring mount.

HOW TO HOTROD A TATTOO MACHINE

MILD FRAME CUSTOMIZING

ONCE YOU'VE GOTTEN A MACHINE RUNNING THE WAY YOU WANT, YOU'LL PROBABLY TURN YOUR ATTENTION TO HOW THAT MACHINE LOOKS. ALTERING THE APPEARANCE OF YOUR MACHINE FRAME IS NOT HARD. WITH A LITTLE PLANNING AND A FEW BASIC HAND TOOLS YOU CAN CUSTOMIZE ANY FRAME.

WE PICKED UP THIS MICKEY B FOR UNDER 80 DOLLARS. WE HAD TO REPAIR THE TUBE VISE AND TUNE THE MACHINE UP BUT IT NEVER MADE IT INTO ANYONE'S WORKING ROTATION. THE MACHINE RAN GOOD, BUT IT WAS JUST ANOTHER MICKEY B.

THIS STYLE OF SIDE PLATE FRAME HAS BEEN MADE BY MANY SUPPLIERS OVER THE YEARS, IT WAS PROBABLY FIRST BUILT AND SOLD IN VOLUME BY MILTON ZEIS. SPAULDING AND ROGERS CALL THEIR CAST VERSION OF THIS FRAME THE SUPREME. THE NAME SUPREME IS NOW OFTEN USED TO DESCRIBE THIS STYLE OF SIDE PLATE, NO MATTER WHO THE MAKER IS, DUE TO THE HIGH PRODUCTION NUMBERS OF THE SPAULDING SUPREME.

THE MICKEY B IS A PRE-FAB. THE BACK SPRING MOUNT AND THE THICK FRAME BASE ARE WELDED TO THE SIDE PLATE.

CAST OR PRE-FAB, THIS CLASSIC FRAME STYLE IS A PERFECT STARTING POINT FOR A MILD CUSTOM MACHINE.

THE FIRST THING TO DO IS DECIDE WHAT CHANGES YOU WANT TO MAKE TO THE FRAME. I NEVER LIKED THE LOOK OF THE DEEP V CUT INTO THE SIDE PLATE ON THIS MACHINE. THE SQUARENESS OF THE EDGES OF THE SIDE PLATE GIVE THIS MACHINE A SORT OF UNFINISHED APPEARANCE. ROUNDING OUT THE CORNERS AND EDGES OF THE SIDE PLATE AT THE TOP

(BEFORE) FRAME STRIPPED WITH HAND GRINDER

MEANWHILE...ON THE BEACH...

OF THE BACK SPRING MOUNT AND AT THE FRONT WHERE IT MEETS THE FRAME BASE WILL GO A LONG WAY TO MAKING THIS MACHINE LOOK SMOOTHER AND LESS LIKE A ROUGHLY FINISHED PRE-FAB.

NEXT, COMPLETELY DISASSEMBLE THE MACHINE AND MARK THE CHANGES YOU PLAN TO MAKE DIRECTLY ONTO THE FRAME. THAT WAY YOU CAN WORK RIGHT UP TO THE LINE AND NOT GO TOO FAR.

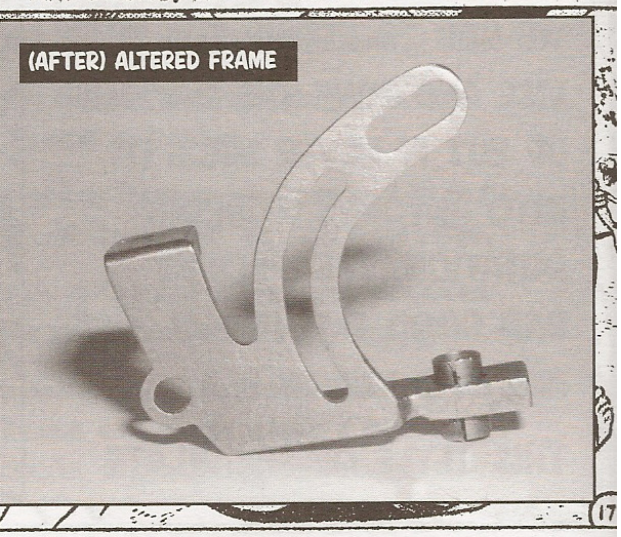
(DURING) STRIPPED FRAME SPRAYED WITH MACHINISTS BLUEING. CHANGES MARKED WITH SCRIBE

REWIRING A MACHINE ISN'T USUALLY NECESSARY, BUT CAREFULLY DONE WIRING CAN GREATLY IMPROVE THE APPEARANCE OF A MACHINE.

THE OPTIONS FOR FINAL FINISH ON A FRAME ARE UNLIMITED. YOU CAN SPEND AS LITTLE AS A FEW DOLLARS AND SPRAY PAINT THE FRAME YOURSELF, OR YOU CAN SEND IT OUT TO BE POWDER COATED OR PLATED.

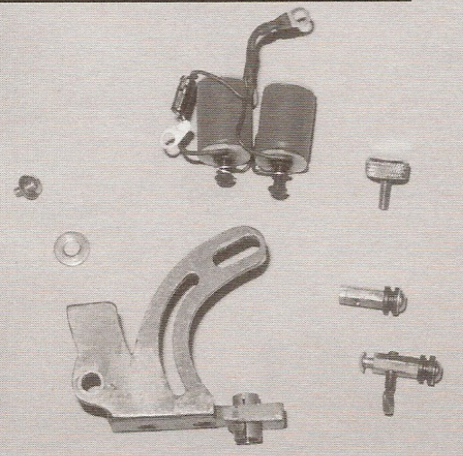
REMEMBER, FINISHING WORK TAKES TIME - DON'T HURRY. USE FINER AND FINER SANDPAPER UNTIL THE FINISH OF THE FRAME IS EXACTLY HOW YOU WANT IT. PAINT OR CHROME WON'T HIDE ANYTHING.

--AND *STICKS*, LEAVING SLASH *DANGLING*--

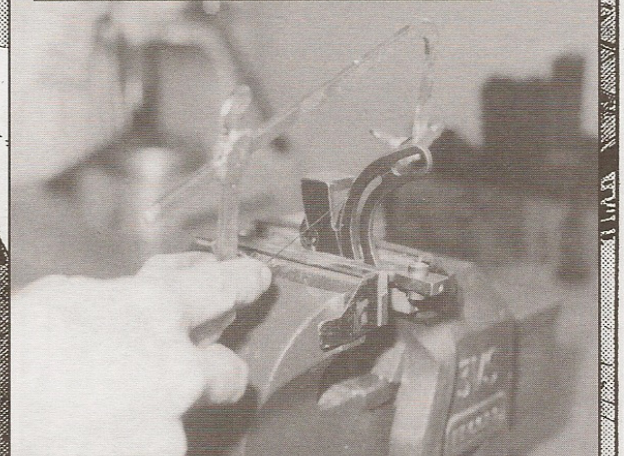


(AFTER) ALTERED FRAME

1. MACHINE IN PARTS, FRAME STRIPPED



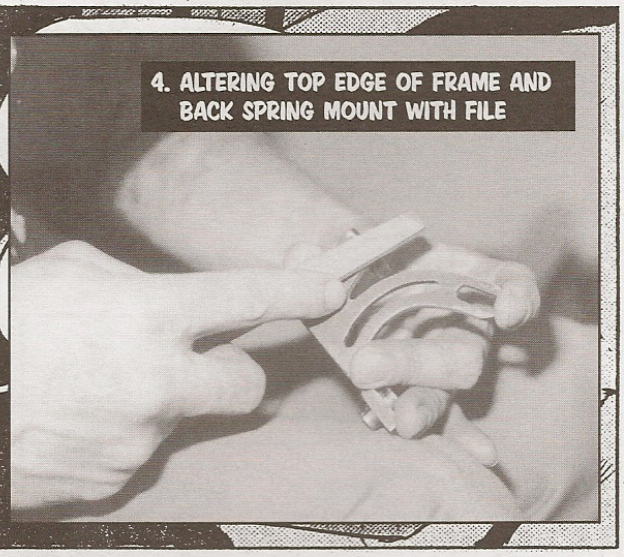
2. CUTTING AWAY LARGE AREAS WITH SAW



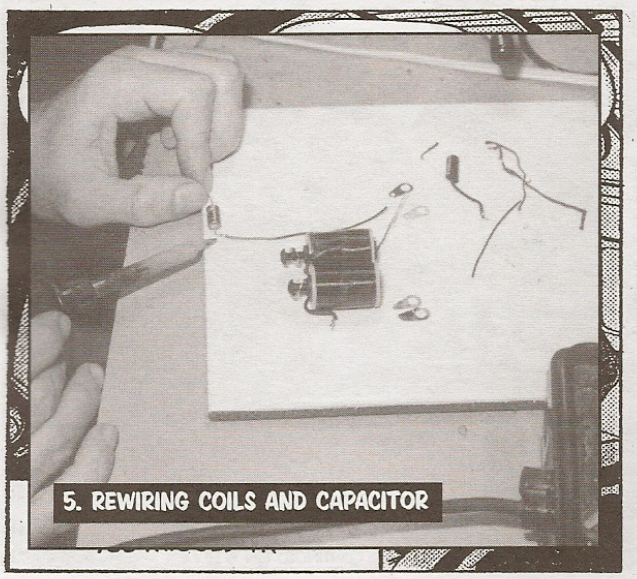
AND INSIDE THE *PLANE*...

3. TAKING AWAY SMALLER AREAS WITH FILE

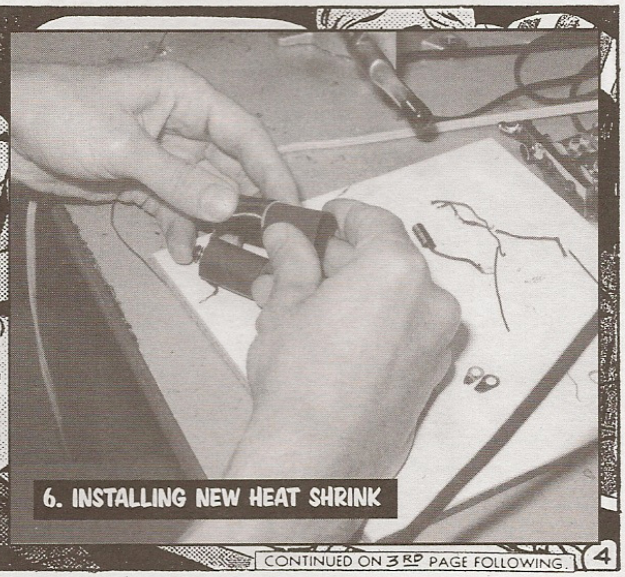
4. ALTERING TOP EDGE OF FRAME AND BACK SPRING MOUNT WITH FILE



5. REWIRING COILS AND CAPACITOR



6. INSTALLING NEW HEAT SHRINK



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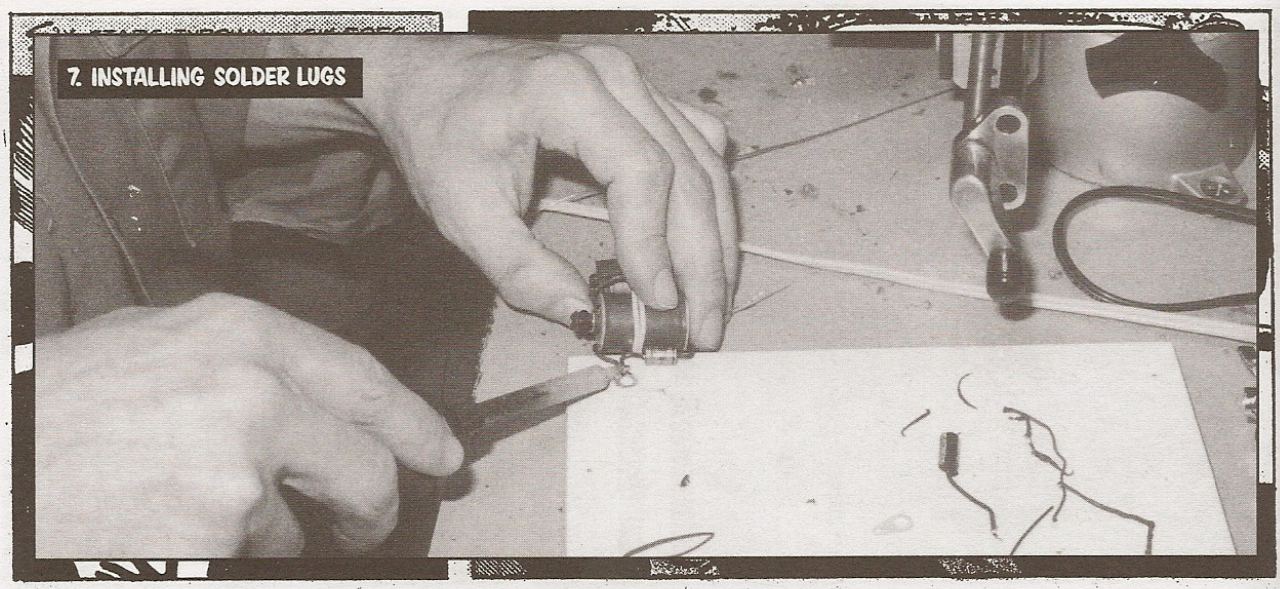
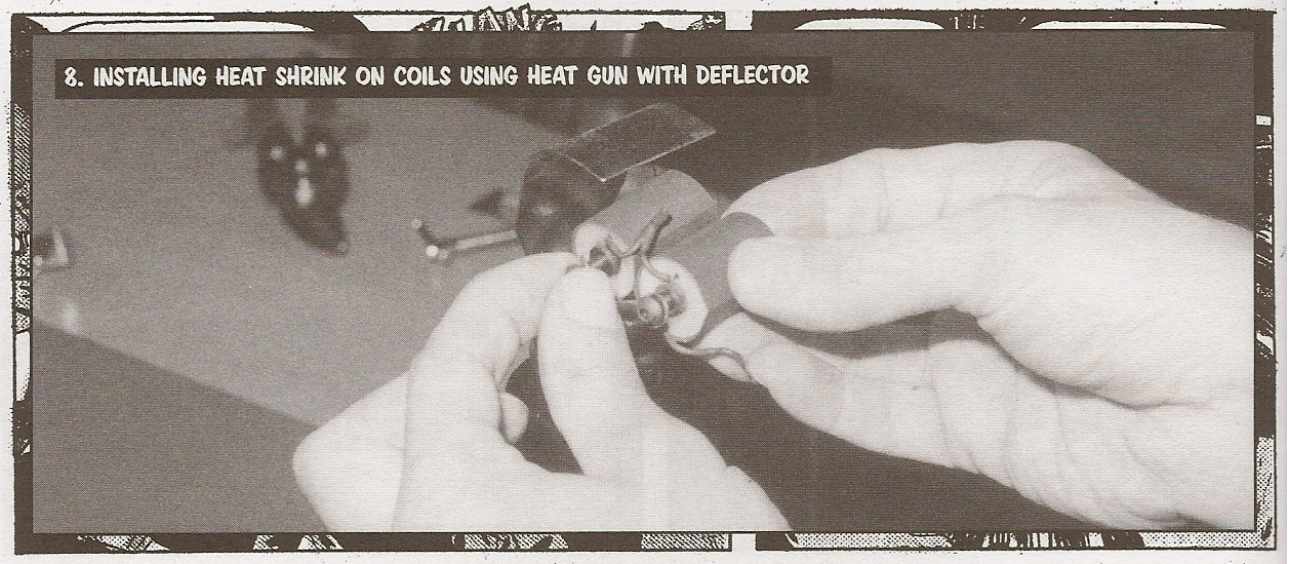
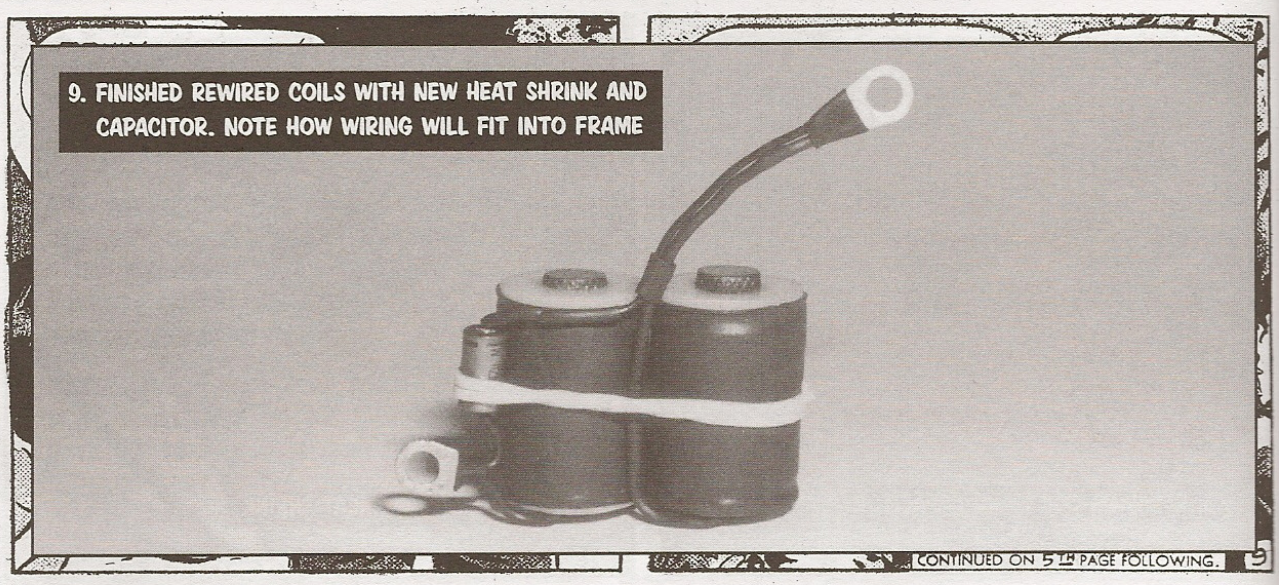
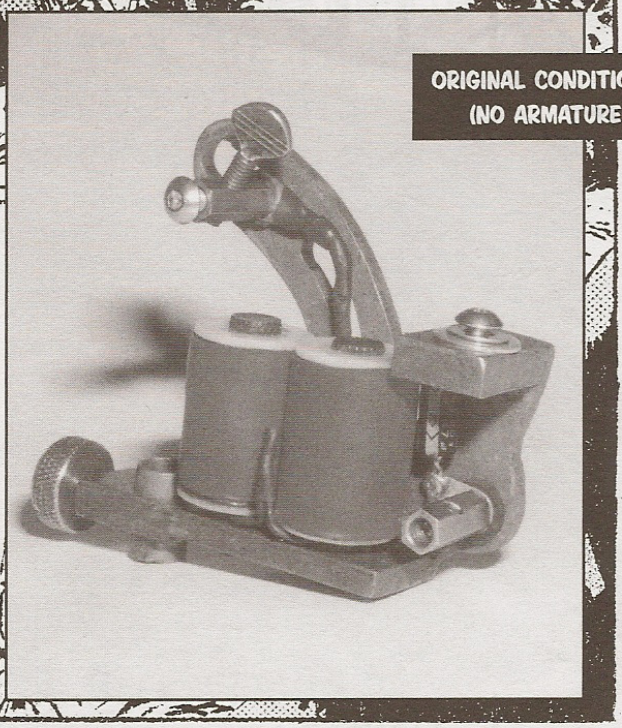

7. INSTALLING SOLDER LUGS


8. INSTALLING HEAT SHRINK ON COILS USING HEAT GUN WITH DEFLECTOR


9. FINISHED REWIRED COILS WITH NEW HEAT SHRINK AND CAPACITOR. NOTE HOW WIRING WILL FIT INTO FRAME
CONTINUED ON 5TH PAGE FOLLOWING.

IT IS A CONTEST TO *BEHOLD* ... A TEST OF *STRENGTH* AND *AGILITY*--



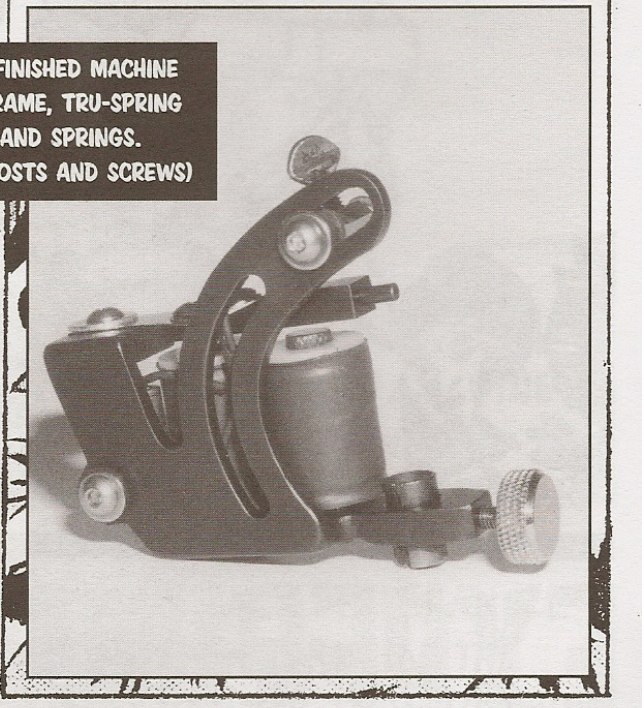
ORIGINAL CONDITION - A LITTLE ROUGH.
(NO ARMATURE BAR OR SPRINGS)

...OF TWO DIFFERENT STYLES SPAWNED BY TWO *CULTURES*...

...TO RENDER PERMANENT *DEFEAT* TO THE LOSER...

RE-ASSEMBLED, RE-FINISHED MACHINE
WITH BLACKENED FRAME, TRU-SPRING
ARMATURE BAR AND SPRINGS.
(ORIGINAL BINDING POSTS AND SCREWS)

...TO SPLASH THE LOSER'S *BLOOD* IN THE UNCARING DUST...

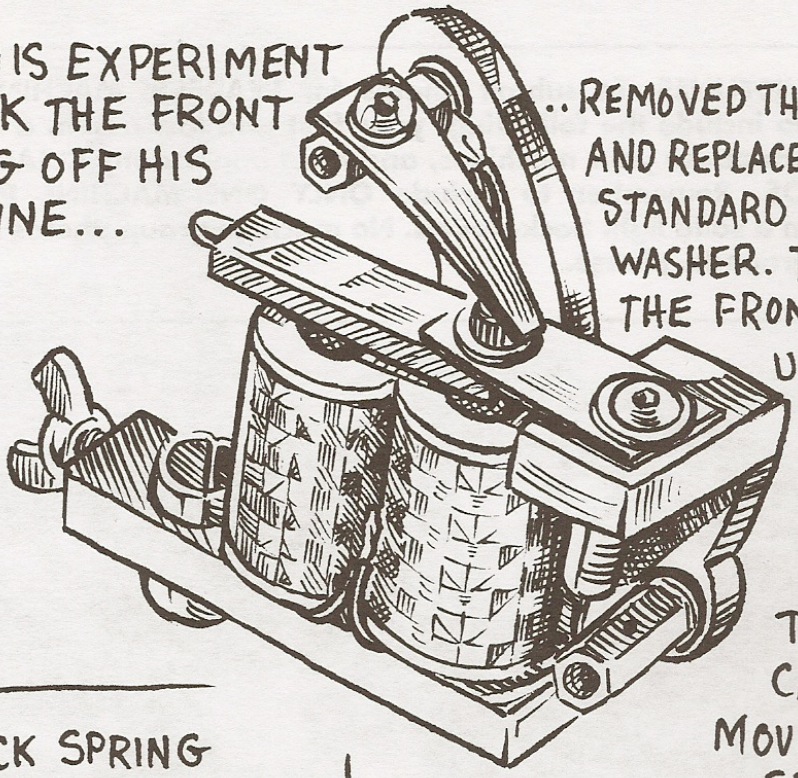


The SAILOR JERRY

EXPERIMENT BENCH

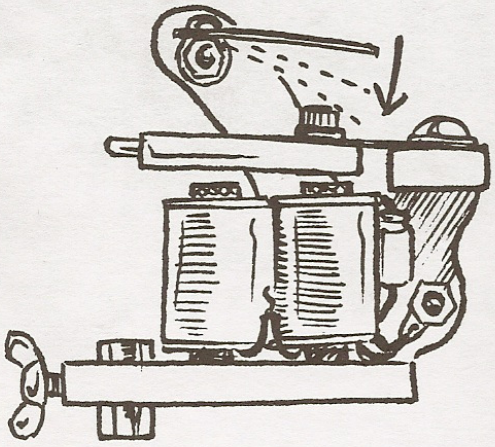
ALTHOUGH HE WASN'T A SUPPLIER, SAILOR JERRY WAS PERHAPS THE MOST INNOVATIVE MACHINE BUILDER EVER. AN INGENIOUS PROBLEM-SOLVER AND MASTER CRAFTSMAN, HE EXAMINED EVERY ASPECT OF TATTOOING.

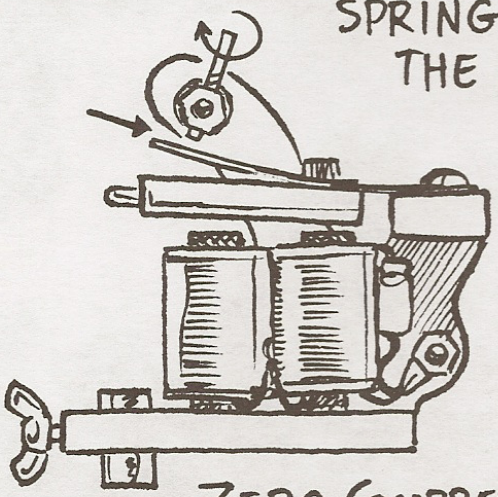
IN THIS EXPERIMENT HE TOOK THE FRONT SPRING OFF HIS MACHINE...



...REMOVED THE CONTACT SCREW AND REPLACED IT WITH A STANDARD SCREW AND WASHER. THEN ATTATCHED THE FRONT SPRING, UPSIDE-DOWN TO THE TOP BINDING POST. THE CONTACT POINT WAS THEN ON THE CAP SCREW THAT MOUNTED THE BACK SPRING TO THE A-BAR!

THE BACK SPRING ANGLE OF DEFLECTION WOULD DETERMINE THE STROKE LENGTH. THE FRONT SPRING WOULD BE ANGLED DOWN UNTIL IT MADE CONTACT. THIS WOULD RESULT IN A ZERO-COMPRESSION SET-UP.

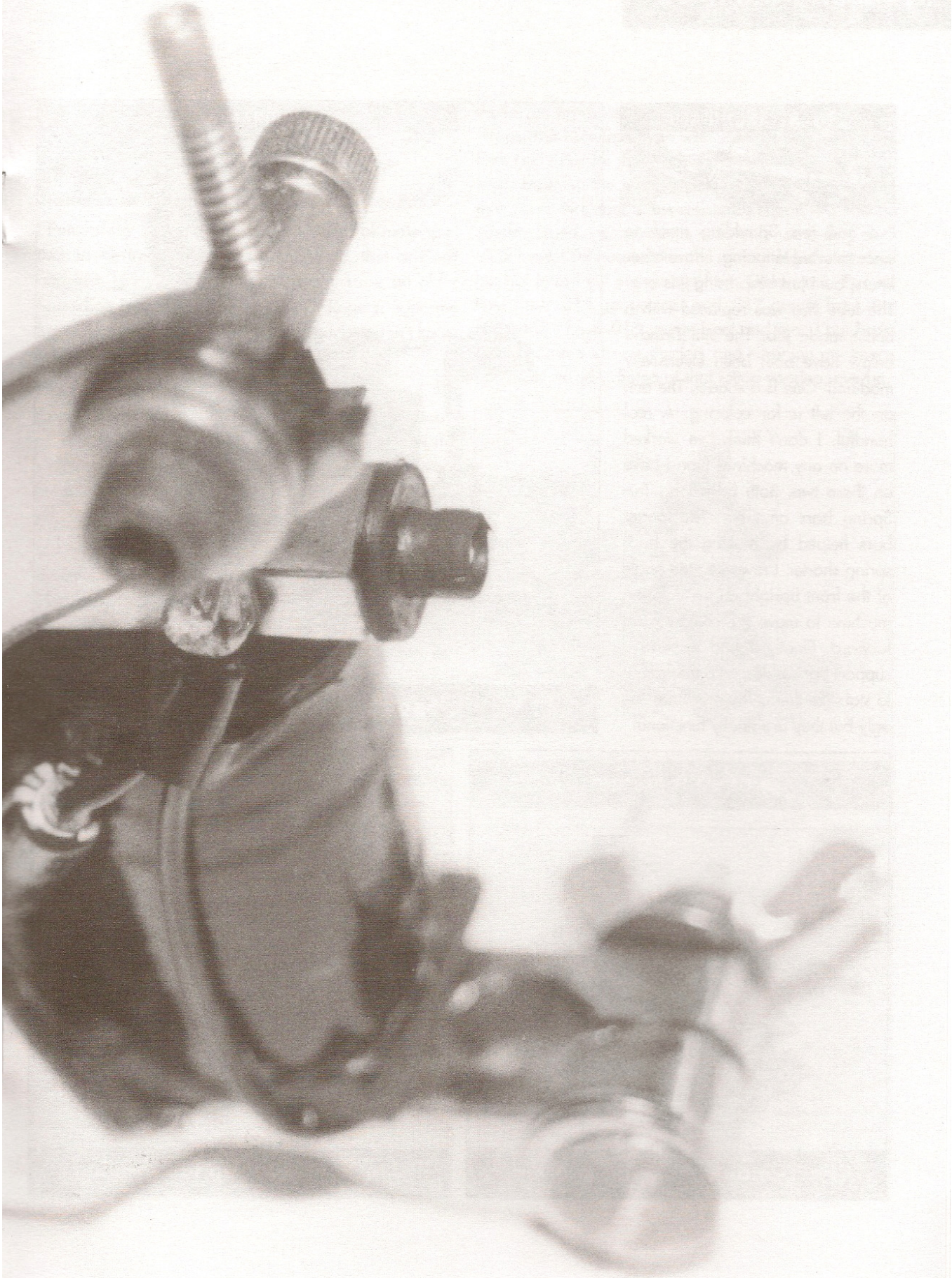




ZERO-COMPRESSION CAN BE SET UP ON ANY MACHINE. TURN THE CONTACT SCREW OUT UNTIL THE SPRING AND ARMATURE BAR ARE CLEAR. SET STROKE LENGTH BY ADJUSTING BACK SPRING ANGLE OF DEFLECTION. THEN TURN IN THE CONTACT SCREW UNTIL IT IS TOUCHING THE FRONT SPRING. ADJUST VOLTAGE.

READERS' MACHINES

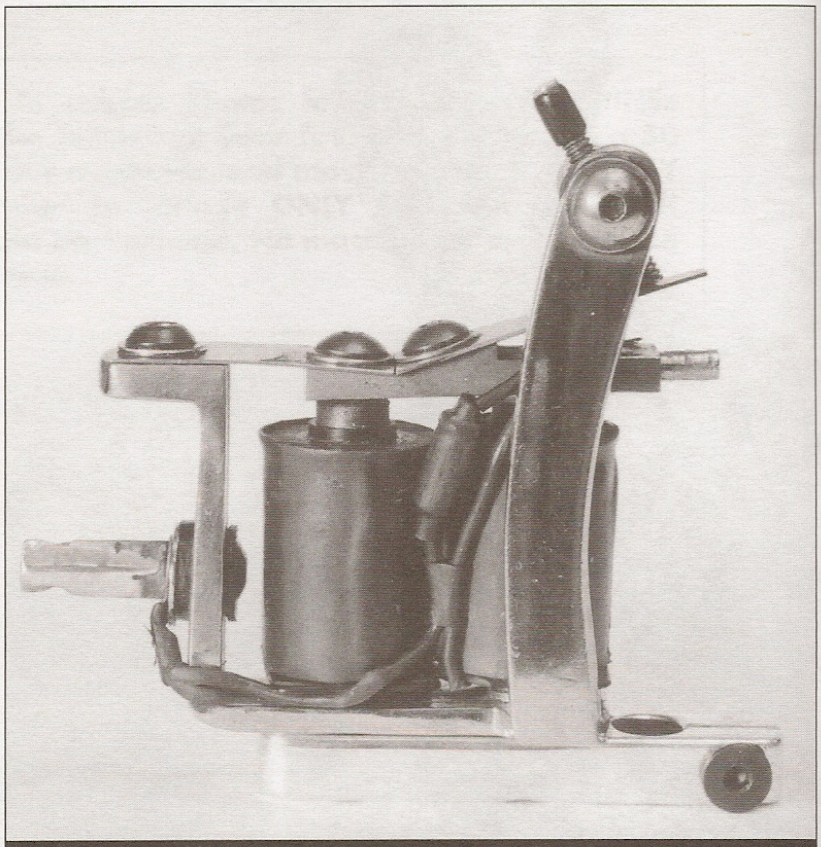
SUBMISSION GUIDELINES. To submit photos for READERS' MACHINES please be sure to include the following: your first and last name, a 50 to 100 word blurb about your machines, and most importantly CLEARLY MARKED PHOTOS. Remember to include ONLY ONE MACHINE PER PHOTO. Shoot on a solid light background. No machine group photos on patterned backgrounds, please.



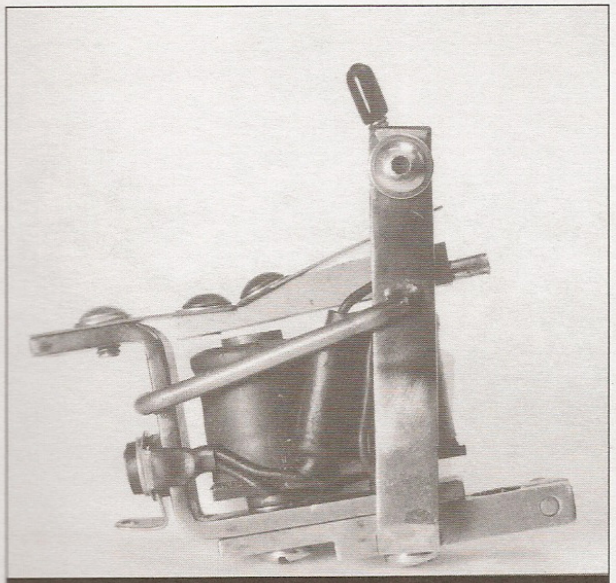
READERS' MACHINES

STUART ARCHIBALD

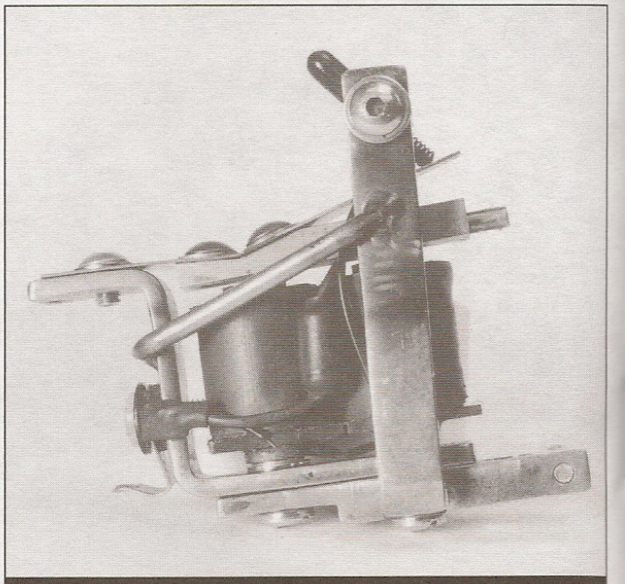
I've had this Spaulding machine since I started tattooing. I have other liners, but I just keep using this one. The tube vise was replaced with a home made job. The Jim Dandys below have both been extensively modified. One is a shader. The one on the left is for coloring. A real handful. I don't think I've worked more on any machines than I have on these two. Both have long Tru-Spring bars on them. The longer bars helped by making the back spring shorter. I reworked the angle of the front upright on the coloring machine to move the contact point forward. Finally, I had to have a support bar welded onto the frames to stabilize them. The machines are ugly but they are finally functional.



Spaulding Lightweight



Jim Dandy set up for coloring



Jim Dandy set up for shading

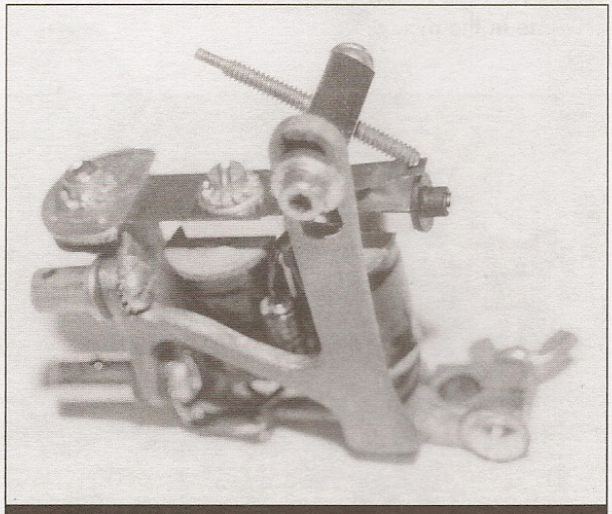
JOSH MAKOWSKI

I think of my liner machine as being kind of male-spirited, in the traditional sense of the word, that is. Hard and fast, kind of aggressive in nature. I use an older Spaulding (and let's not forget about Rogers) Supreme frame that I bought off a guy for fifty bucks. I don't know if I'll ever replace it. It's just so dependable.

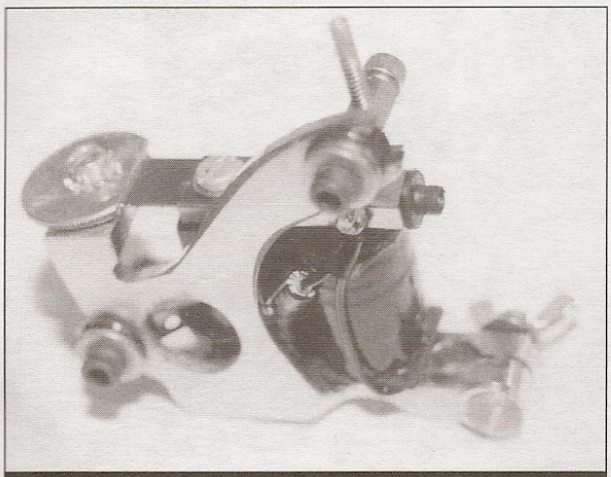
The first thing I did in the process of rebuilding this machine was to hand sand the frame, cutting down on that glary chrome finish. I also smoothed out all the sharp edges. Overall, it is now soft to the touch, very unobtrusive.

My shader machines are more on the feminine side, soft and passive, yet strong in all the right places. Very graceful. I've been working with two National Deluxe machines, the Jonesy square back copies. As with my liner, the only thing National about these girls are their frames. The lime green frame came to me lime green, but the other one was listed as lavender. I swear it was hot pink. Not just pink but HOT ass pink. So with the use of sandpaper, a file, and finally a dremmel tool I stripped that hot pink right off. I like it much better "raw brass" colored. I also used the dremmel to cut the one piece vise into a makeshift quick-change. Good enough for me.

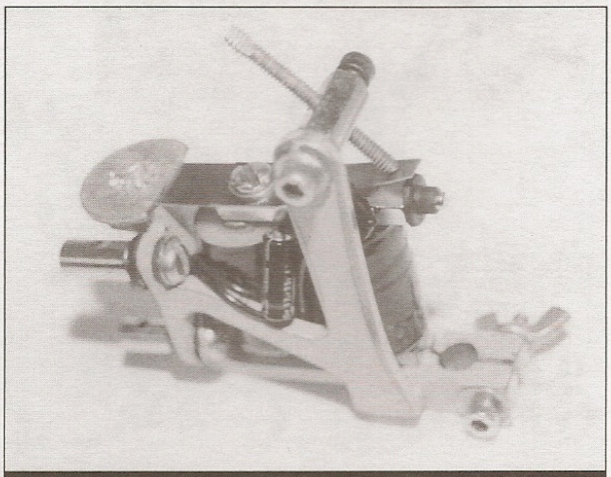
As far as hardware goes, I use Papillon iron core ten wraps, but I rewired them with 22uF capacitors for the liner and 47uF for the shaders. I also cut the excess wire leads between the binding posts down to a bare minimum. Less wire equals less resistance equals less voltage needed. Then, I wrapped the coils with heavy-duty electrical tape. I cut quarters for the rear spring clamps. Last but not least I cut my springs from Eikon stock. For my liner I use .016 gauge rear and .017 gauge front. For my shaders I use .016 gauge front and rear. I use brass contact screws on my shaders and silver on my liners, don't ask me why. Some of that tattoo voodoo, maybe.



National Deluxe



Spaulding Supreme



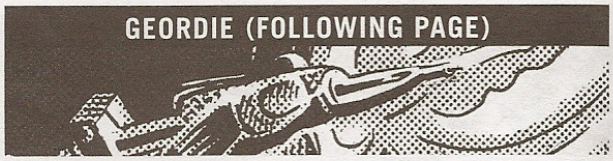
National Deluxe

READERS' MACHINES

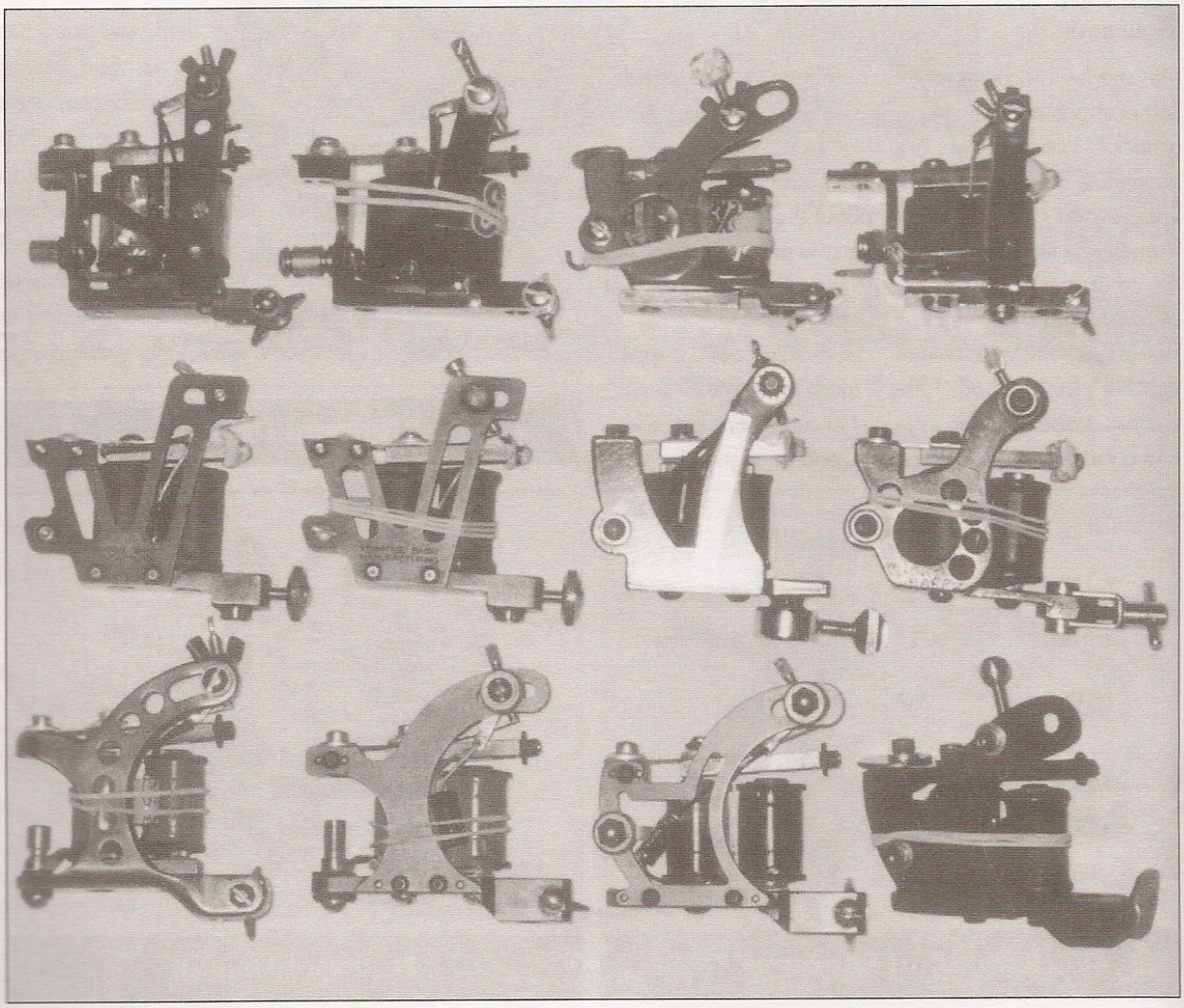
LINDSEY CARMICHAEL (BELOW)

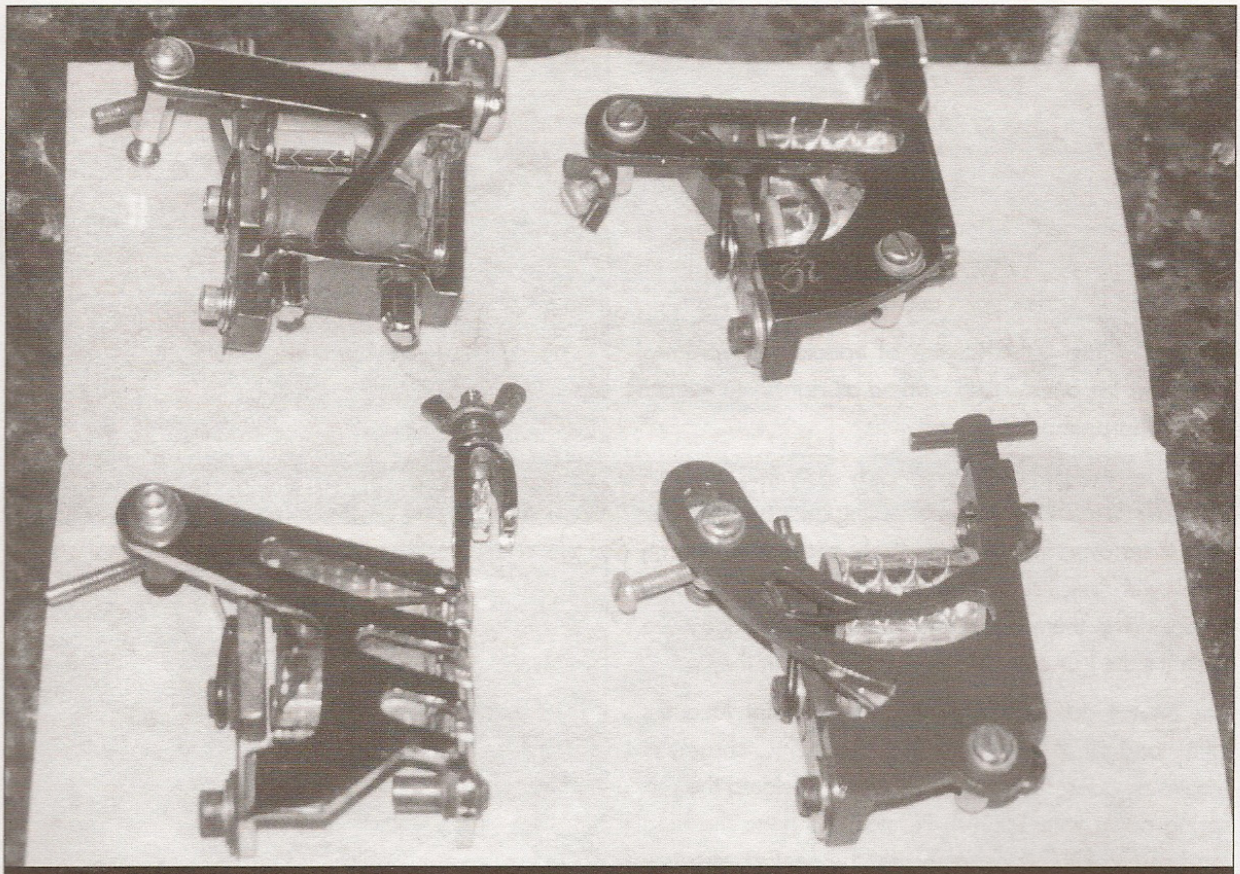
TOP ROW, LEFT TO RIGHT: Brass National, National Swing-Gate, Spellman Anti-drift Liner, Mora Colonel Todd copy. SECOND ROW, LEFT TO RIGHT: Creeper Shader, Creeper Liner, Micky Sharpz, Micky Sharpz Mini-Dial. THIRD ROW, LEFT TO RIGHT: Brass Puente shader, Puente shader, Puente liner, Ciferri liner.
For work I fill up my machine box with six at a time. All of my Puente machines always and then three others. Whenever I get a new one, I trade one out and get the new one in the mix.

GEORDIE (FOLLOWING PAGE)

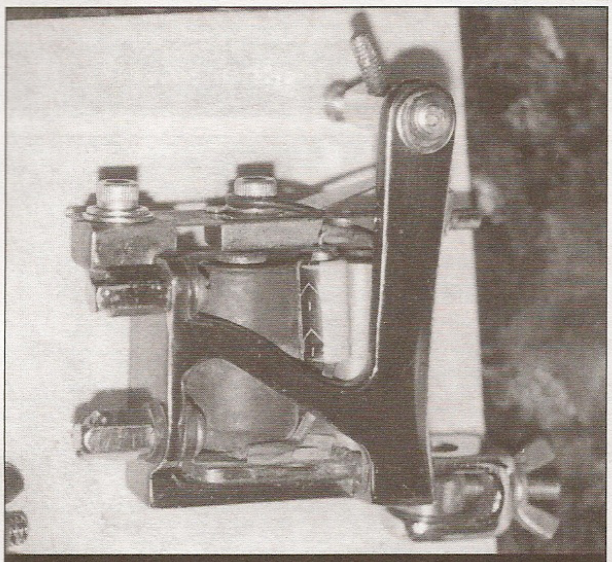


(Submitted by Tim) These are the four machines that Geordie uses every day. Two unmodified Mickey B's, and a Jonesy style frame that has a new tube vise and two different coils. The Johnny Dollar machine is one of two Geordie bought for his first machines. Johnny Dollar is an Australian old timer who has a tattoo shop/supply business.

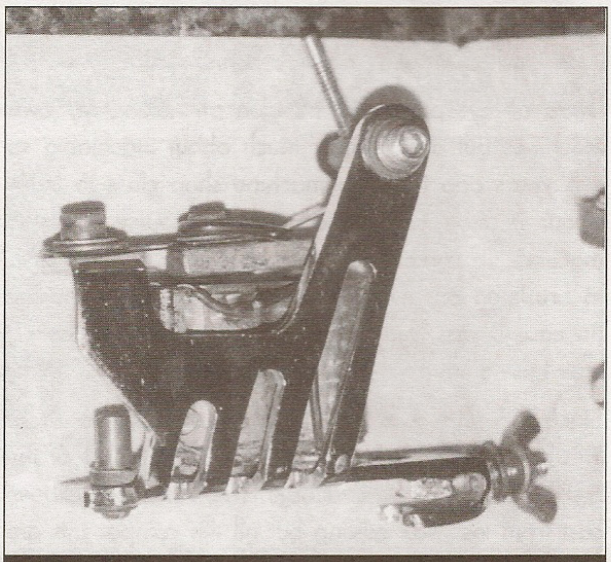




TOP: Jonesy, Mickey B BOTTOM: Johnny dollar, Mickey B



Jonesy with two different coils



Chrome Johnny Dollar

ERIC PARENT

Somehow I think the machines are what got me in... I was a "Lego kid" so anything I could play with and make changes to or customize was something I liked, then again I still do! Machines are just that.

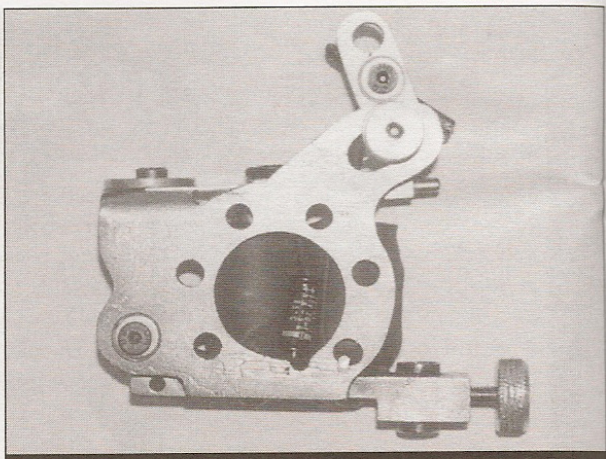
I started with a "classic" pair of Spaulding Supremes; you know the ones... they worked all right but I wanted Micky Sharpz machines...

Since then I've picked up over thirty machines. I usually work with them a bit before deciding if I'll keep them or pass them over, though they rarely end up leaving my hands with their original parts, because it isn't very long before I strip them apart and change what I don't like. Then it's the last call, if I still don't like them they go...

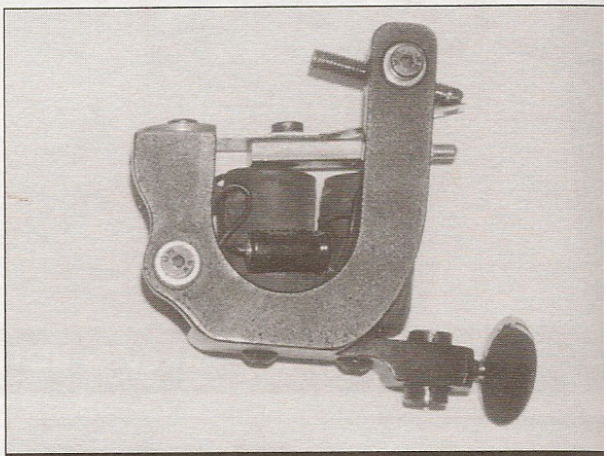
The ones I do keep are stripped of paint lacquers, glitter and all. Anything that's plated (zinc, chrome or whatever) goes. I black oxide them and clamp the rear spring down with Spanish Pesetas. I change the binding posts to either steel or brass, the contact screws to 5 or 6mm copper threaded rod, the armature bars to low carbon black oxide steel, the springs to 1095 blue tempered steel and the coils to ones I make myself (large cores and heavy wire, about 3 ohms worth).

I had always pondered the idea of making my own machines but didn't know much about machining so two years ago I took a machine shop class to learn about it. My class project was of course a tattoo machine. It worked out great so I took another class to brush up on my skills and make another machine (in case it was beginner's luck!). It went even better; now I use them almost every day.

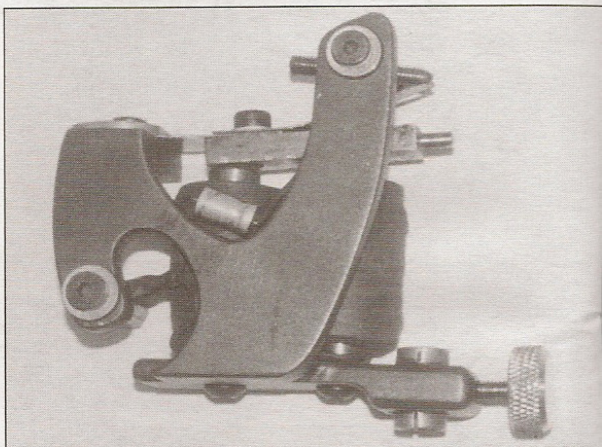
Since then I've put together a small machine shop. This year I will have a limited edition of 100 of the first machine I made available. The frames have been cast from lost wax casting but all the components are built in my shop. There are plans for more hardware like grips and tubes and anything else for the purpose of tattooing.



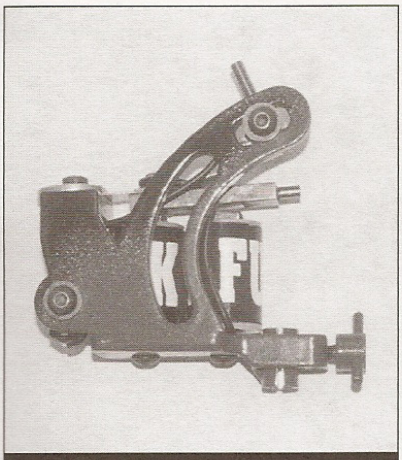
Artisan's Dial



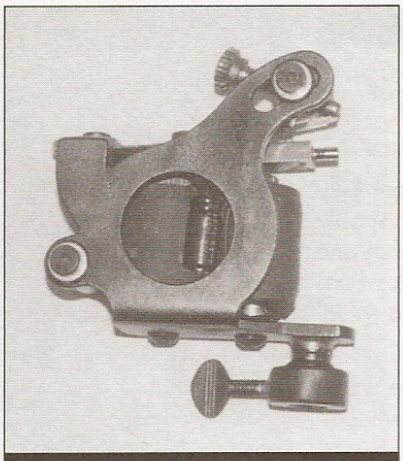
Artisan's Jackhammer



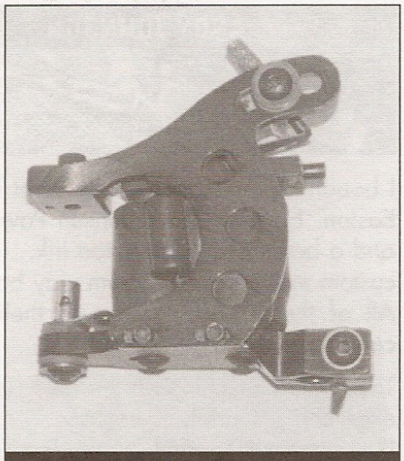
Artisan's Gypsy



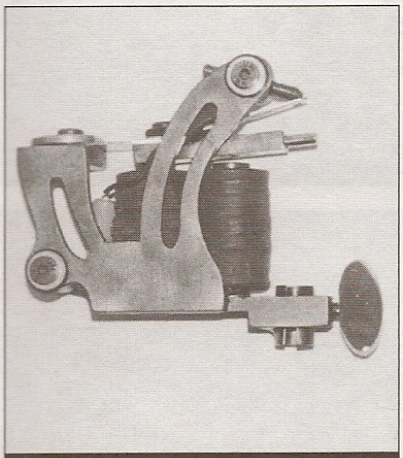
Mickey B Lovelyliner



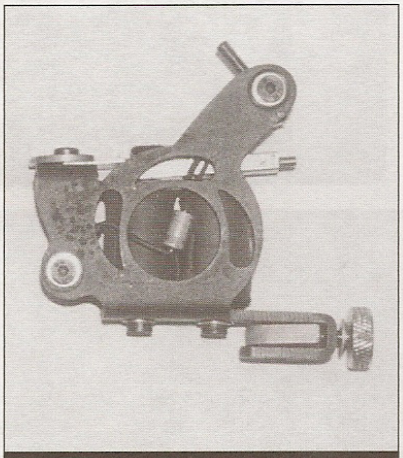
Micky Sharpz T-Dial



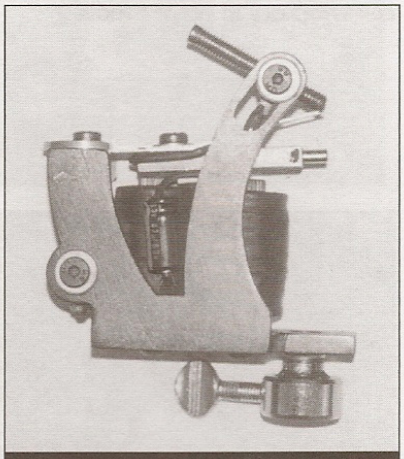
Next Generation Eclipse



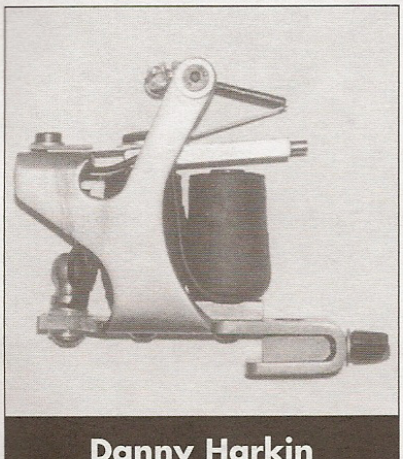
Tony Bennett Quicksilver



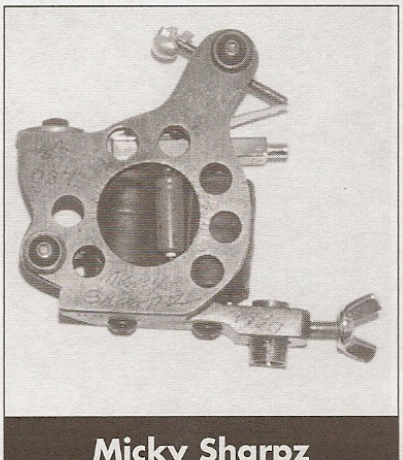
Tony Bennett Varidial



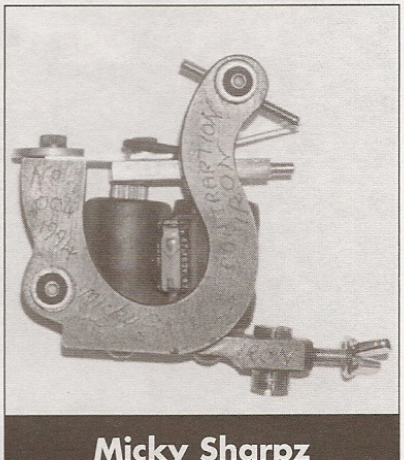
Micky Sharpz Hornet



Danny Harkin
Brass Cutback Liner



Micky Sharpz
Custom T-Dial #87



Micky Sharpz
Contraption #4

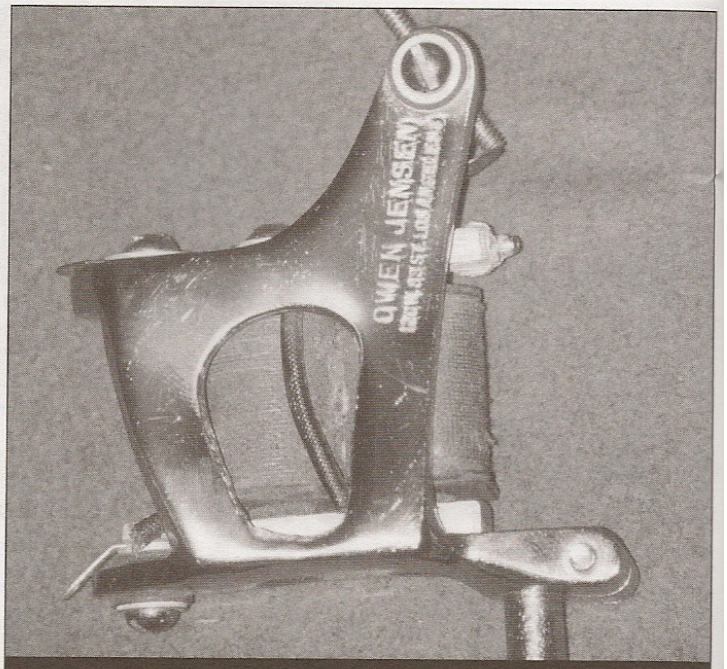
READERS' MACHINES

ANDY JOHNSON

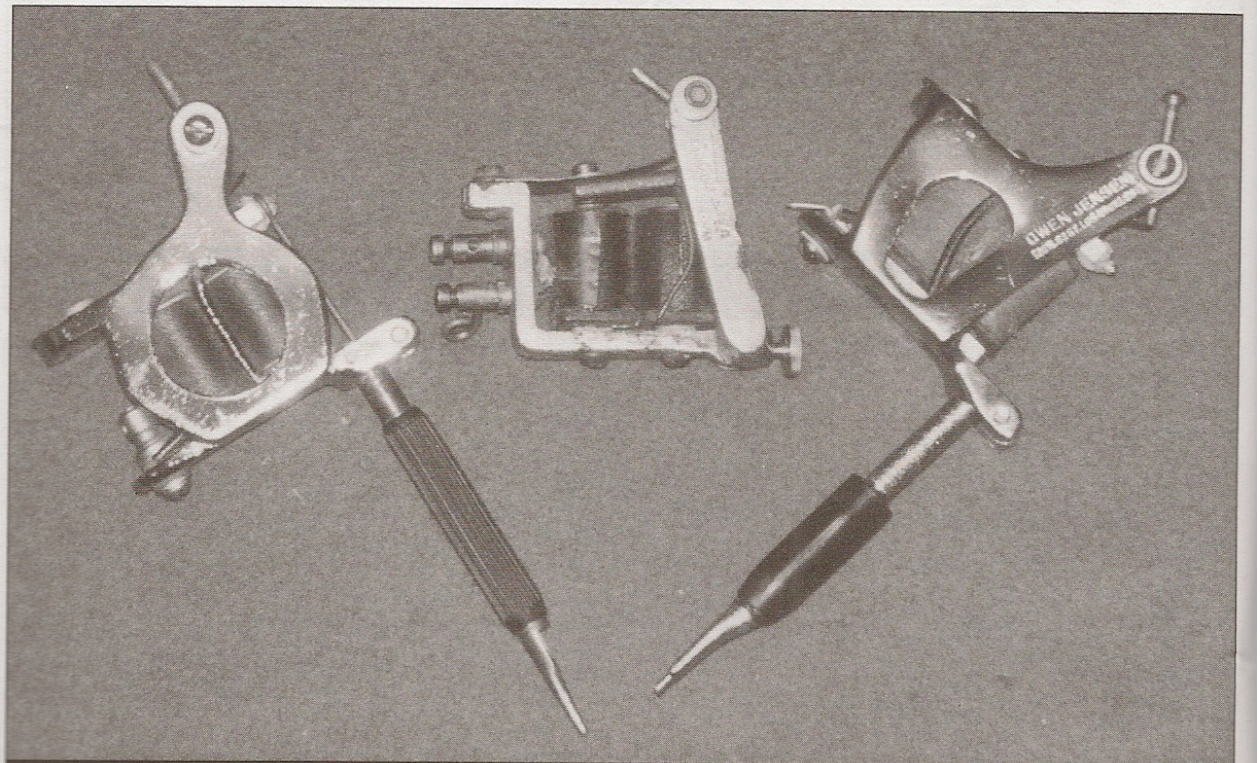
I bought the machine on the right from Billy Easton. He threw in a Jensen Power supply and a bottle of Jensen tattoo ink... all in one custom made travel kit from way back when! All of these machines are in their original condition.

The Waters machine on the next page works excellent. It's pretty clean and runs smooth. Not bad for 80 years!

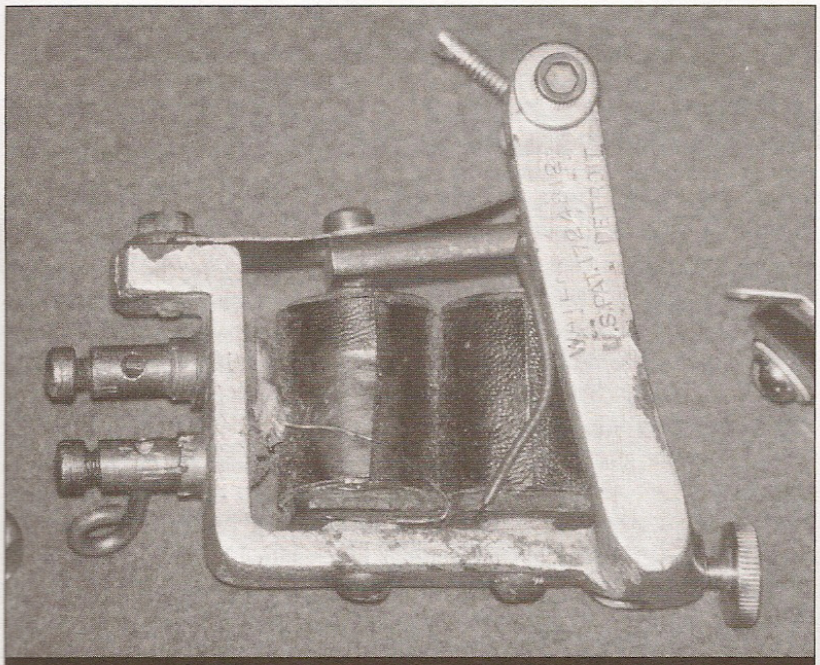
Even though these Jensens have some scratches, they look beautiful. The chrome and the coil wrap are in great condition.



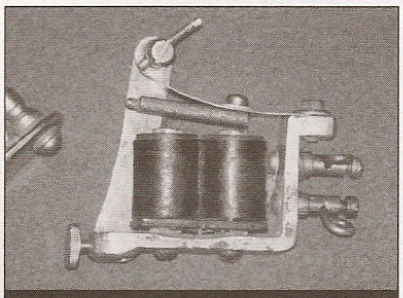
Owen Jensen, late 30's early 40's



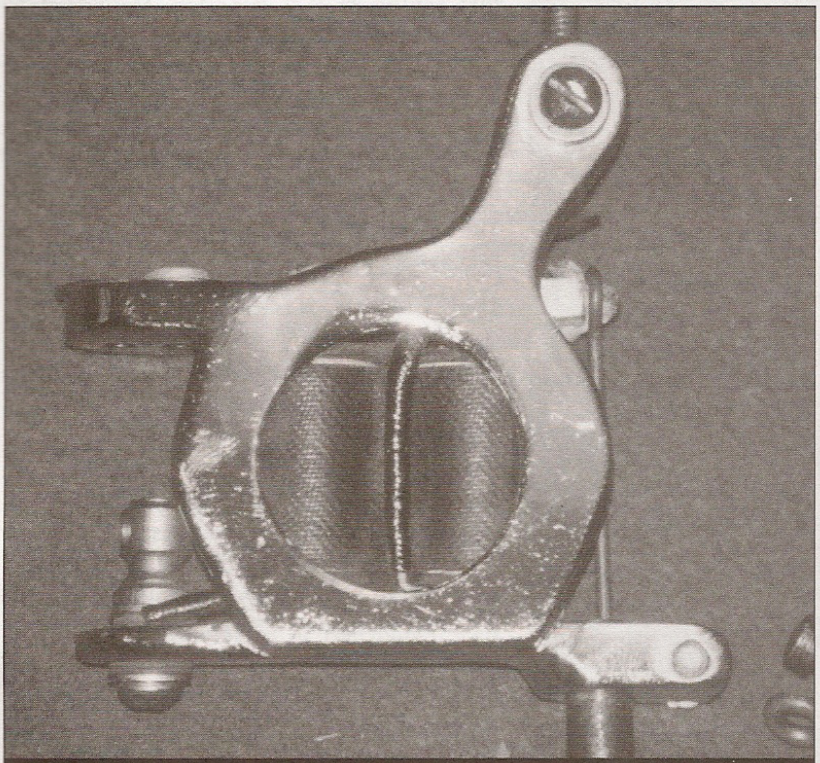
two Owen Jensens with tubes and one Percy Waters



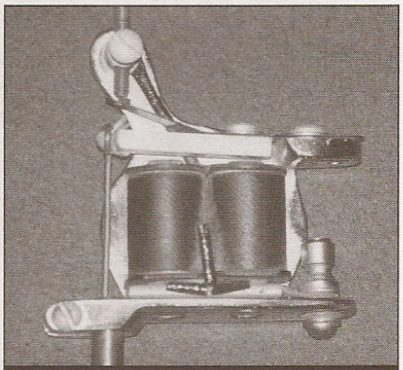
Percy Waters, mid 20's



left side view



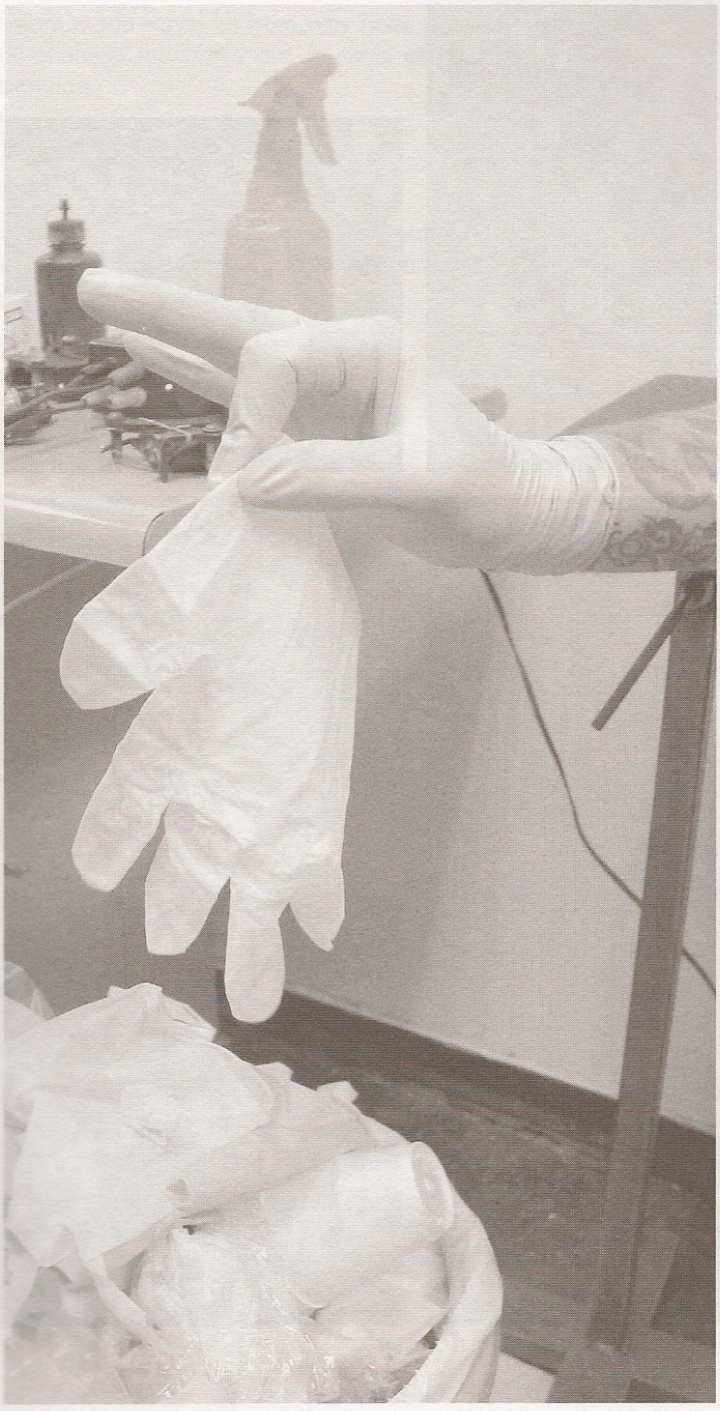
Owen Jensen, mid 40's late 50's



left side view

LATEX REACTIONS IN THE MODIFICATION INDUSTRY

UNDERSTANDING WHY THEY OCCUR AND HOW BEST TO PREVENT THEM



As in the medical community, the piercing and tattooing industries have seen a large increase in the number of practitioners who are either sensitive or allergic to latex gloves and other products. This increase in latex allergies can be attributed to several factors.

One of the primary reasons for the increase in the number of individuals allergic to latex is the institution of Universal Precautions. Universal Precautions has resulted in the increase in the number of latex gloves being used and being manufactured. A secondary factor is the manufacturing process itself and the quality of latex used in the manufacturing process.

There are several different types of reactions that can occur. It is important to understand the types of reactions in order to determine if the reaction is truly a reaction to latex or if the reaction is due to some other factor. Determining the cause of the reaction makes it possible to determine what course of action will prove to be most beneficial.

The following are the most common types of reactions:

IRRITANT CONTACT DERMATITIS

SYMPTOMS

Typical symptoms of Irritant Contact Dermatitis are dry, flaky, irritated areas of skin, most commonly the hands.

COMMON CAUSES

This condition can be caused by frequent hand-washing and drying as well as not properly drying hands after hand-washing. In addition, exposure to powders used on latex gloves can also contribute to this type of reaction. It is important to realize that this type of reaction is not a true allergic reaction.

ALLERGIC CONTACT DERMATITIS

(delayed hypersensitivity)

SYMPTOMS

Symptoms for this type of reaction often resemble a reaction to poison ivy. The skin will often develop oozing skin blisters. This condi-

tion often appears 24-48 hours after exposure and may spread to areas that do not come in contact with latex.

COMMON CAUSES

This condition is most commonly caused by chemicals added to the latex during harvesting, processing or the manufacturing process. It is important to realize that some of the same chemicals used in processing natural rubber latex gloves may also be used in processing synthetic rubber gloves such as Nitrile.

LATEX ALLERGY

(immediate hypersensitivity)

SYMPTOMS

The types of symptoms that appear due to this kind of reaction vary depending upon the level of sensitivity. Reactions may vary from mild (severe skin redness, development of hives and/or itching) to more severe (difficulty breathing, coughing, wheezing, sneezing, runny nose, and/or scratchy throat). In some severe cases, a life-threatening shock may develop. Immediate hypersensitivity reactions typically occur within minutes of exposure to latex.

COMMON CAUSES

This type of reaction occurs as a result of a direct allergy to latex proteins. It is often difficult to determine what level of exposure will cause this type of reaction. In addition, this type of reaction is something that often develops over time, as the individual is frequently exposed to latex.

The issue of reactions to latex gloves in our industry has become an issue which can no longer be ignored.

Reactions of this nature have the potential to affect our ability to work safely or to work at all. It is important to be able to recognize these types of reactions and to be able to prevent the likelihood of such reactions occurring.

One of the most effective ways to prevent allergic reactions to latex is to minimize the use of latex products, especially gloves. One common, and very effective substitute for latex gloves are gloves made of Nitrile. Nitrile is a synthetic rubber that contains no natural rubber latex. Nitrile provides a barrier protection equal, if not better, than that of latex. However, as was mentioned previously, keep in mind that Nitrile is still a form of rubber, and as such, may still be processed using some of the same chemicals used to process latex gloves.

If latex gloves are used, the following precautions can be taken to reduce the occurrence of various reactions:

- Use latex gloves which are powder-free. The powder can be absorbed into the skin, carrying with it latex proteins. While powder-free latex gloves may be slightly more expensive, they can greatly reduce the potential for reactions. In addition, if hands are dried thoroughly after washing, donning of powder-free latex gloves is no more difficult than donning latex gloves that are powdered.
- Wash your hands both before and after the procedure. This will help remove latex proteins that become embedded in the skin.
- Wash your hands using a mild soap and dry them thoroughly.
- Keep your skin in good conditions using lotions and/or creams. There are many different products available which are designed specifically for the purpose of maintaining the health of the skin on the hands. Be sure that any hand lotions used are not oil-based, as the oil will break down the latex, increasing your potential for exposure to pathogens as well as increasing the amount of latex absorbed into your skin.

For further information, feel free to contact:

Health Educators
(216) 623-0815
www.hlthedu.com

David Vidra, C.L.P.N., M.A., OSHA Authorized Outreach Instructor.

FOUR REASONS LATEX GLOVES SHOULD NOT BE USED IN TATTOOING AND ZERO REASONS WHY THEY SHOULD.

1. ALLERGIES
   Latex allergies and latex glove related allergies are becoming more and more common amongst tattooers and clients.
2. PETROLEUM PRODUCTS AND THE ILLUSION OF SECURITY
   It is common knowledge that latex and petroleum products should never be used together. The breakdown of latex gloves in contact with petroleum jelly is generally not visible. A compromised glove may seem like a barrier when it is not - which puts the client and the tattooer at risk.
3. THE TOOLS OF TATTOOING
   Tattooing is done holding a hard, often knurled metal tube. The constant hand motion of tattooing distresses the latex glove causing the surface of it to break down quickly, usually in combination with exposure to petroleum products. This introduces latex particles into the open tattooed area.
4. THE PROCESS OF TATTOOING
   Tattooing usually causes very little trauma to the skin. The tattooed area heals quickly, potentially trapping and healing latex proteins and particles into the skin, complicating latex reactions should they occur.

STEFAN D INTERVIEWS

WARREN LEE

SINCE 1994 WARREN LEE HAS BEEN MAKING MACHINES FOR TATTOOERS. HIS CHOICE OF MATERIALS AND GEOMETRY ARE FAMILIAR, BUT HIS FRAMES ARE OFTEN A LITTLE LEFT... AND RIGHT OF CENTER. YOU MIGHT HAVE SEEN HIM IF YOU'VE BEEN AT THE INK SLINGERS BALL IN THE LAST FEW YEARS. I CAUGHT UP WITH HIM THIS PAST MARCH.

the Innovator

WARREN LEE I've been working on tattoo machines for several years now. I was working as a graphic artist... well, I was into graphic arts all through school, putting album covers on t-shirts, silk-screening and airbrushing. In 1993, I got my tattooing license in the little town of Pahoa on the big island of Hawaii.

STEFAN D When did you move to California?

I came back to California in '94, helping out with the family, my mother was having health problems, so I came back... I actually kept tattooing for a year or so over here and then I just kinda gravitated into machines.

What steered you in that direction?

Well looking after my mother and now my father I could work at home more easily. I can work any hours I need, and it seemed a natural thing for me because everyone in my family are machinists.

So you had access to a machine shop?

Exactly, really just my fathers little shop here at home. He had worked at Lockheed and also done some automotive mechanics as well. He taught me a lot about metal you know, how to work with metal... how to drill and tap things. All the basic stuff that most people don't really have a clue about how to do.

Did your father work with you directly on any of the machines you developed?

Not really no... it was more things I learned years before from him, by working with him. I started my first machine before I came back to California. In Hawaii I was actually making one out of clay, you know, just an idea I had in my mind of a shape and that became the Signature model... real swirly and Coca-Cola style.

What are the essentials of machine design for you?

Well, it's different with each individual design. Actually Robert Benedetti had a lot to do with how I work. I had several talks with him and he kinda steered me in a different direction on machine making. It's not hard to use the same geometry, but still give the machines some style. Unlike the first machines I had that looked like slot car frames, very chunky. One was a Joe Kaplan machine and I think the other was an Owen Jensen, but it was all beat up. I also had a Spaulding and Rogers and that gave me the idea that you could make stuff real straight and with proper right angles... but I decided to go with lots of curves and roundness... which unfortunately is a lot harder when you're machining something out.

So you basically stayed with the geometry from those machines?

I actually tried to use Bill Jones' configuration. Which was the same or very similar to Percy Waters and Zeiss measurements. I tried a bunch of different things, like the Innovator machine. The upright binding post is in the front shifting the weight forward. Much like something Robert (Benedetti) had told me about. And I got the idea from a Charles Wagner patent to place the coils on my machine side by side. I really didn't copy his machine, he had all kinds of doo-dads to adjust his.

How well does it work?

I don't know, it seems to work out like a big single coil machine. I mean, when I set up coils I always mic them, measure them exactly and then ensure the yoke is sitting perfectly level. But the stroke on these machines is still sharp and finicky. I think the front and back coil is a much better configuration. It holds the bar longer and flatter where as the side to side is just a short little throw. It works fine for a teletype machine but as a tattoo instrument it is limited.

It seems the first innovators of the tattoo and stencilling machines were using more complex design elements?

Yes they were. And the quality of work even in the tubes... I can't even imagine how they made them. They're machined so exquisitely it's just incredible. And I still get a lot of ideas from the old Edison patents and other teletype machines.

You said the first machine was made of clay. Obviously your working machines are made of something else?

I made several machines out of easily worked metals like aluminium and brass. Then I switched to casting because you can only file so many machines before you burn out. I mean... you have to still chase the mold and get off all the high spots and parting mold spots... and milling is more for prototypes.

I see that you chose not to use aluminium...

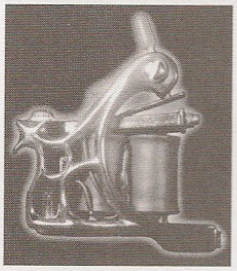
Yes the aluminium machines tended to heat up quickly and when they corrode with time they turn black. So I chose a metal somewhere between bronze and brass. A little less tin I think, and good for casting.

What sort of casting do you employ?

I started with something very crude... the old sand casting method. The problem is that when you make machines that way, they have to be tapered so they'll come out of the mold... so nothings straight or right angled on the machine. You have to go back and do a lot of milling and filing. Now I use an injection mold. They come out pretty much identical... maybe a little change in thickness when the pressure varies.

What is your perspective on tattooing and its machines today?

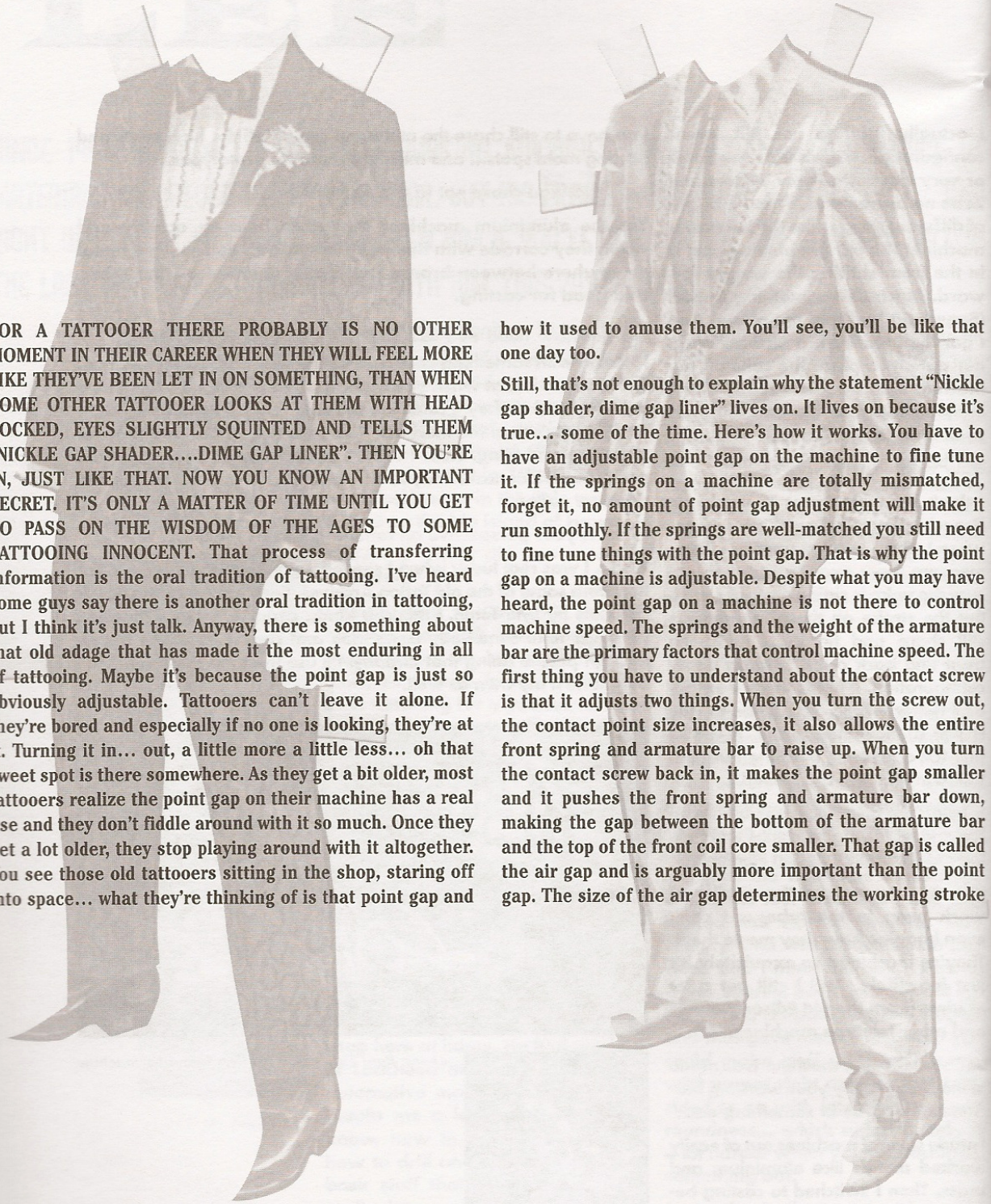
Well... I was real lucky when I started. I got hold of good information from some of the old Tattoo Archives. Some of the Tattoo News booklets by Lyle Tuttle, I think. It kinda struck a chord with me... I'll never take somebody else's idea and copy it, because there's enough people doing that already. I'll use the tried and true ideas but make it my own as well. MGM



above: Roni Zulu machine, left: Signature machine

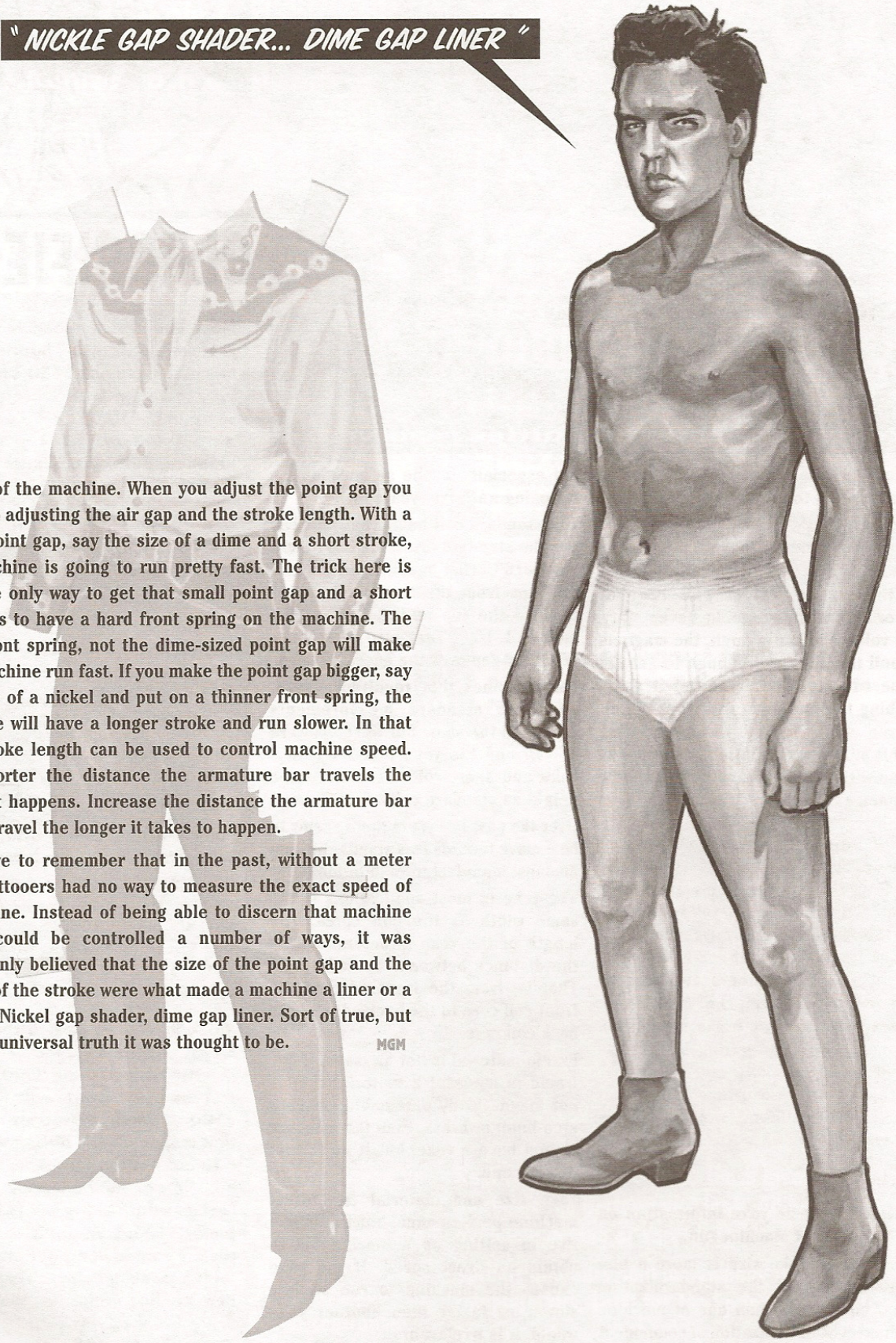
TATTOOING, WHAT HAPPENED?

By Bill Baker



FOR A TATTOOER THERE PROBABLY IS NO OTHER MOMENT IN THEIR CAREER WHEN THEY WILL FEEL MORE LIKE THEY'VE BEEN LET IN ON SOMETHING, THAN WHEN SOME OTHER TATTOOER LOOKS AT THEM WITH HEAD COCKED, EYES SLIGHTLY SQUINTED AND TELLS THEM "NICKLE GAP SHADER....DIME GAP LINER". THEN YOU'RE IN, JUST LIKE THAT. NOW YOU KNOW AN IMPORTANT SECRET. IT'S ONLY A MATTER OF TIME UNTIL YOU GET TO PASS ON THE WISDOM OF THE AGES TO SOME TATTOOING INNOCENT. That process of transferring information is the oral tradition of tattooing. I've heard some guys say there is another oral tradition in tattooing, but I think it's just talk. Anyway, there is something about that old adage that has made it the most enduring in all of tattooing. Maybe it's because the point gap is just so obviously adjustable. Tattooers can't leave it alone. If they're bored and especially if no one is looking, they're at it. Turning it in... out, a little more a little less... oh that sweet spot is there somewhere. As they get a bit older, most tattooers realize the point gap on their machine has a real use and they don't fiddle around with it so much. Once they get a lot older, they stop playing around with it altogether. You see those old tattooers sitting in the shop, staring off into space... what they're thinking of is that point gap and how it used to amuse them. You'll see, you'll be like that one day too.

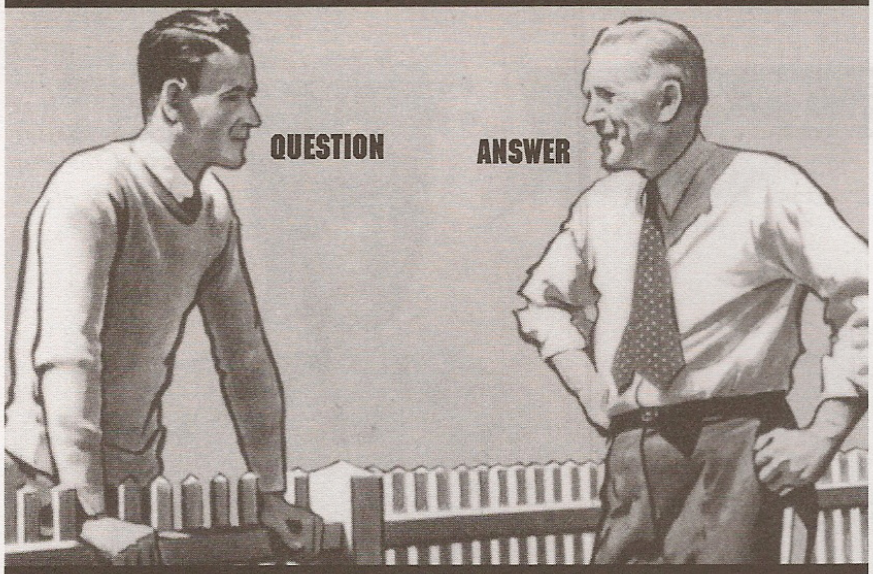
Still, that's not enough to explain why the statement "Nickle gap shader, dime gap liner" lives on. It lives on because it's true... some of the time. Here's how it works. You have to have an adjustable point gap on the machine to fine tune it. If the springs on a machine are totally mismatched, forget it, no amount of point gap adjustment will make it run smoothly. If the springs are well-matched you still need to fine tune things with the point gap. That is why the point gap on a machine is adjustable. Despite what you may have heard, the point gap on a machine is not there to control machine speed. The springs and the weight of the armature bar are the primary factors that control machine speed. The first thing you have to understand about the contact screw is that it adjusts two things. When you turn the screw out, the contact point size increases, it also allows the entire front spring and armature bar to raise up. When you turn the contact screw back in, it makes the point gap smaller and it pushes the front spring and armature bar down, making the gap between the bottom of the armature bar and the top of the front coil core smaller. That gap is called the air gap and is arguably more important than the point gap. The size of the air gap determines the working stroke



length of the machine. When you adjust the point gap you are also adjusting the air gap and the stroke length. With a small point gap, say the size of a dime and a short stroke, the machine is going to run pretty fast. The trick here is that the only way to get that small point gap and a short stroke is to have a hard front spring on the machine. The hard front spring, not the dime-sized point gap will make that machine run fast. If you make the point gap bigger, say the size of a nickel and put on a thinner front spring, the machine will have a longer stroke and run slower. In that way stroke length can be used to control machine speed. The shorter the distance the armature bar travels the faster it happens. Increase the distance the armature bar has to travel the longer it takes to happen.

You have to remember that in the past, without a meter most tattooers had no way to measure the exact speed of a machine. Instead of being able to discern that machine speed could be controlled a number of ways, it was mistakenly believed that the size of the point gap and the length of the stroke were what made a machine a liner or a shader. Nickel gap shader, dime gap liner. Sort of true, but not the universal truth it was thought to be. MGM

WHAT'S YOUR PROBLEM?



Your technical difficulties resolved.

I was curious as to whether the magnets on a rat-tat-tat pull the armature bar down or rather the contact screw pushes the front spring away? Simple enough?

Seriously, S.G.

Well...the magnets must pull the bar down, or the machine would never start. If your voltage is low enough, the magnets won't pull the bar down enough to get the machine running, but if you get it going by pushing the bar down with your finger, it will run on it's own. So the front spring flexing is part of the equation. As is usually the case with machines, it's not as simple or complex as it seems.

I would like to ask if there is one particular size or range of sizes a yoke should be to get the most out of your machine? Is it possible that running a yoke too thick or too thin can affect performance? Most machines I see run about a 3/16" or 1/8" yoke, yet I've seen others running far thinner that seem to run O.K. Most of my machines are made of brass and use a 1/8" yoke. Could I be getting better performance by using a different size yoke? Could the material the frame is made of (copper, steel, aluminum) or could the use of the machine (liner, shader) warrant a different size yoke?

E.J.S.

There is some basic yoke information on page 42, Issue 2 of Machinegun.

The question of yoke size is more a history question about the standardization of tattoo equipment, than one of machine performance. Standardization of component sizes allow manufacturers to use many of the same parts to make different machines. That makes it possible for them to buy larger quantities of standard sized stock, which lowers their cost of production.

Cost saving is important in any industry, but especially in one as marginal as tattooing was sixty years ago.

The standard coil height became 1 1/4". The standard armature bar height was 3/16". That made the standard distance from the top of the frame base to the top of the back spring mount, 1 1/2". That also included a 1/16" air gap over the back coil core.

For machines that required a yoke, all those standard measurements remained the same but the coils were 1" tall and the yoke was 1/4". So a yoke and short coils were the same height as standard coils, 1 1/4".

Over the past few years there seems to be a move towards less standardization amongst manufacturers in tattooing.

The yoke in most applications is the same width as the coil cores. The length of the yoke is determined by the distance between the coil cores. That is, from the front edge of the front coil core to the back edge of the back coil core.

Frame material is not an issue. If the frame is made of a material that is not magnetically permeable, such as aluminum or brass, then the machine should have a yoke, but it would run without one.

Yoke size and material can affect machine performance, but the objective in setting up a machine is to obtain an exact speed. If the yoke causes the machine to run slightly slower or faster than another yoke would, it is irrelevant.

Speed is obtained by spring thickness in conjunction with armature bar weight. Other factors and variables that are unique to each machine are simply factors to be overcome or dealt with when setting up a machine.

CLASSIFIEDS

Machines rebuilt tuned to your preferences, also handmade machines start at $150 and go up depending on frame style. 8 wrap coils 13.00 set. Call big dave 1-443-995-8822 or email bigdave9999@comcast.net

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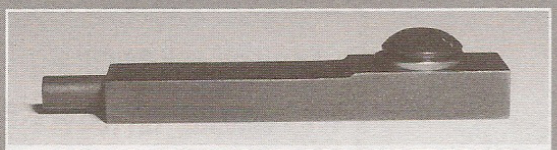
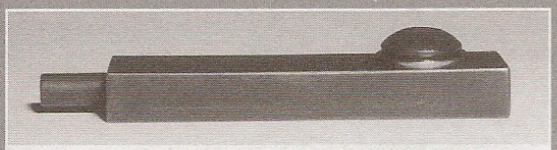
ERIC PARENT (see p32) Artisan Custom Tattoo Hardware (905)347-4591. Shop references are required.

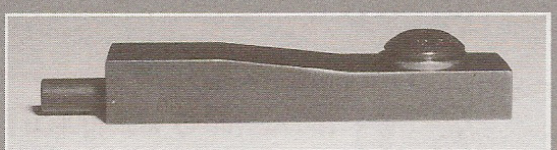
CONVENTIONAL SYSTEM of spring mounting allows you to adjust the angle of deflection on front and rear springs to customize each application.



1587 LIGHT-WEIGHT CONVENTIONAL
Lightest bar will produce the highest speeds without closing out point gap or shortening stroke length.

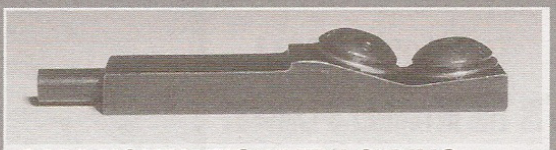


1588 MID-WEIGHT CONVENTIONAL
Medium weight bar controls speed while maintaining proper point gap and stroke length.

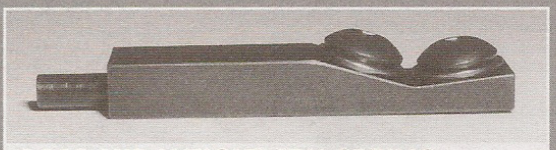


1589 HEAVY-WEIGHT CONVENTIONAL
Maximum size bar gives maximum weight to slow machine down without need of increasing point gap or stroke length.

TRU-SPRING SYSTEM of spring mounting ensures consistency in spring angle of deflection. Makes changing spring gauges quick and accurate.



1444 LIGHT-WEIGHT TRU-SPRING
Lightest bar will produce the highest speeds without closing out point gap or shortening stroke length.



1445 MID-WEIGHT TRU-SPRING
Medium weight bar controls speed while maintaining proper point gap and stroke length.

1446 HEAVY-WEIGHT TRU-SPRING
Maximum size bar gives maximum weight to slow machine down without need of increasing point gap or stroke length.

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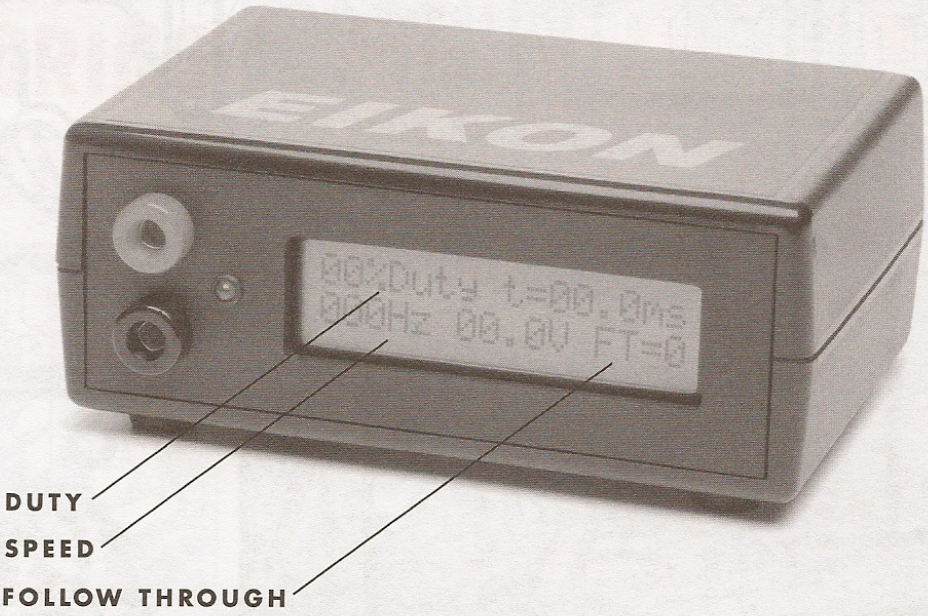

Does not alter **HOW** your machine runs. Backlit LCD clearly displays **FIVE** major electronic measurements from machine. Displays voltage **AT THE MACHINE** not at the supply as with voltmeters on power supplies. This allows you to precisely set your machine to exact same voltage no matter what power supply you use!

Duty cycle display will show you how much back spring pressure you have. This is vital to know if you ever need to change springs. **The speed of the machine** is the most important factor in how a machine works for you. Even a change of five cycles per second will change machine function–but is undetectable without a meter. **The follow through** display shows how cleanly the contact points are opening and closing.

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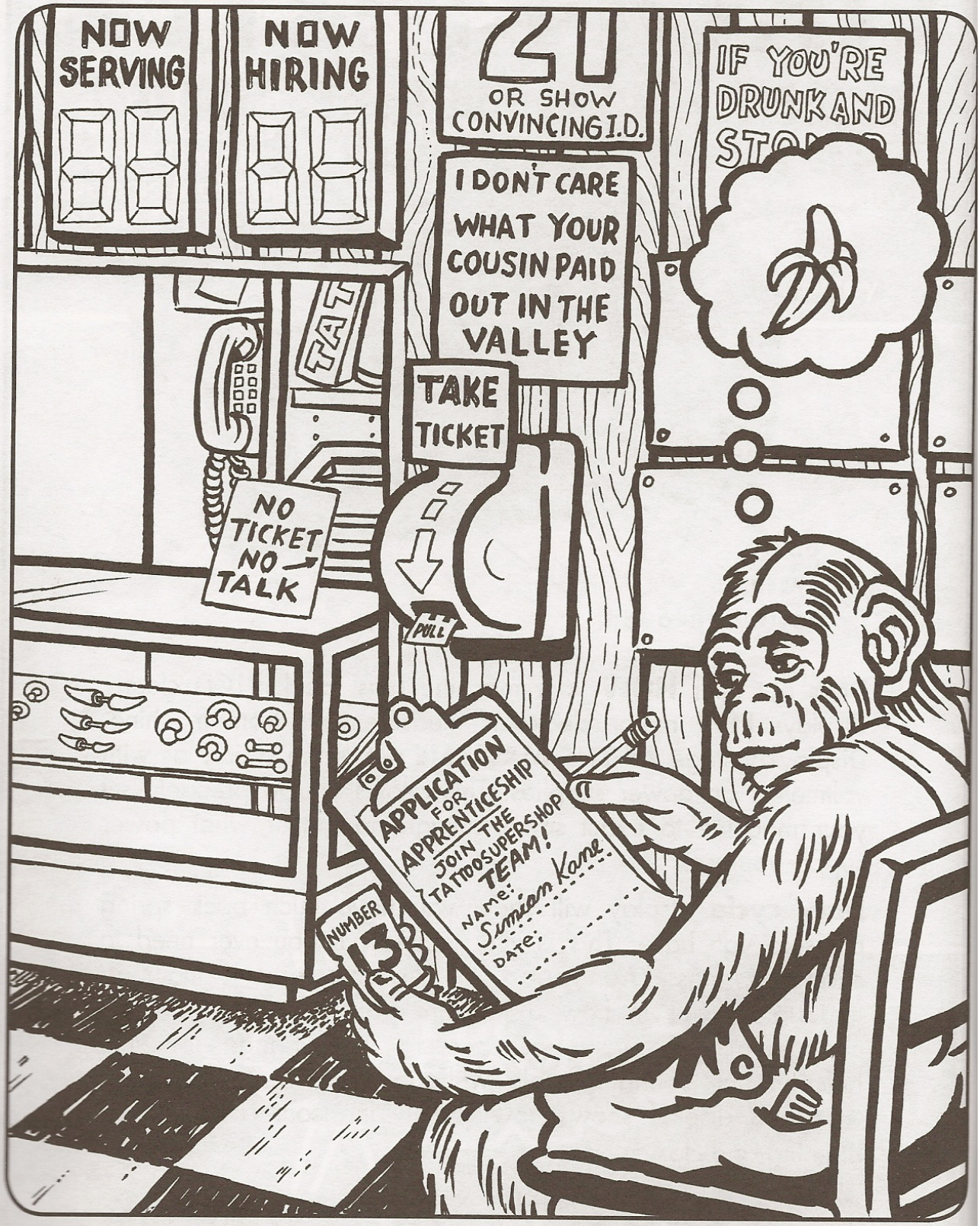

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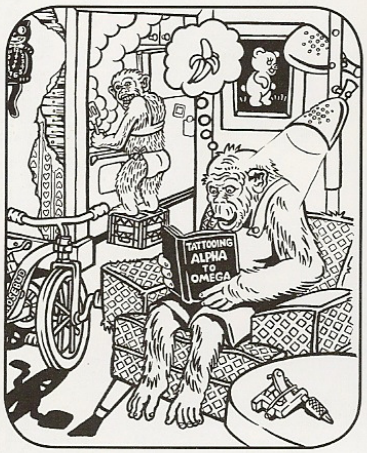

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